MECHANICS · AUTOS · HOME IMPROVEMENTS

POPULAR SCIENCE

July 35c DESK

MONTHLY

Missile Ships We're Building

PAGE 120

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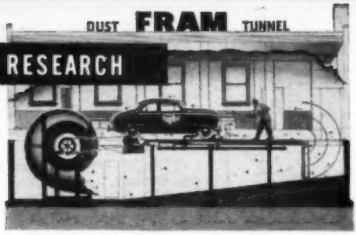

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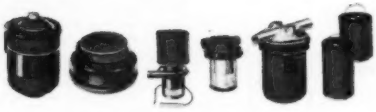

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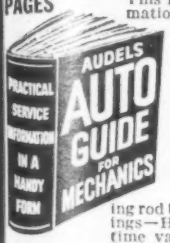

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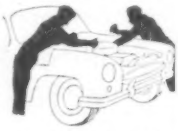

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drove his brand-new Ifa down to Helsinki and encountered traffic lights for the first time. He was so enchanted by the pretty change of color, red to yellow to green, that he let the engine stall. The line behind him lengthened—but nobody honked. Finally a truck driver leaned from his cab and, noticing the Lapland license plates, yelled, "Isn't that green light enough for you, you stupid Lapp? Or are you waiting for the Northern Lights to start?"

N. V. MONTIN, Lahti, Finland

. . . Chicago taxicabs have not had horns or bells or anything for years . . .

CHARLES GRANT, Evanston, Ill.

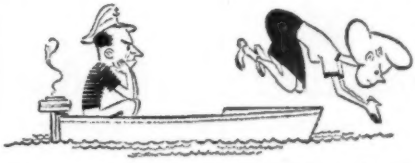
. . . Furnish the car with a horn that sounds inside the car as loud as outside. Then they'll honk only in an emergency.

FRANK VICTOR, New York City

M.P.G. Afloat

Dig those crazy mileage figures in your March article, "Matching the Motor to Your Boat" [p. 100].

I have a 14-foot Peterboro round-bottom boat (315 lb.) and a 1955 Johnson 10 outboard engine. In 10 to 15 miles I kill five gallons. That comes to three miles per gal-



lon at best, where your article indicates I should be getting 18.

I don't know what you're burning, but it sure ain't the ordinary oil-well juice.

KEN ROBITAILLE, Detroit

There are many variables that affect gas mileage in boats—and their impact is more pronounced than in cars: throttle setting, diameter and pitch of propeller, motor tune, correct gas/oil mixture, an occasionally defective motor, weight of boat and load, trim of boat, hull shape, hull condition, weather, currents.

Unless you're getting a bad break on practically all those factors, you ought to come closer to our maximum figures.

How to Build a Glass House

In your March letters column [p. 14] Wendall C. Briggs asked what kind of ce-

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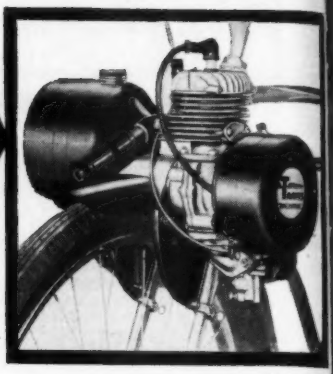

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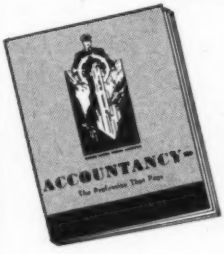

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Please send me, free of all cost or obligation, your illustrated book, "Accountancy, The Profession That Pays."

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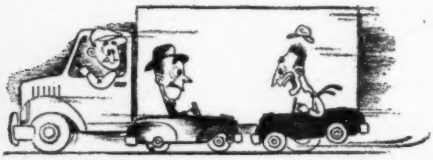
ment he could use to build a house out of his collection of 2,000 glass jugs. Well, I had the honor of helping to erect the "beer-bottle house" at Tonopah, Nev., many years ago. The builder used silicate of soda diluted with three parts water to mix his cement with, and the house is still partly intact and the cement still sticking to the bottles. I suggest that Mr. Briggs experiment with this mixture.

BARNEY BARNES, Mountain View, Calif.

Good Idea Goes Begging

A contributor to your "I'd Like to See Them Make" page in March [p. 92] suggests a driver-operated sign on the back of trucks to signal cars behind when it's safe to pass.

I live in Iowa, where the highways are



so narrow that a truck must drive with the inside wheels on or near the center line. This means that to investigate the possibility of passing, a motorist must pull over into the line of approaching traffic.

So, about six years ago, I drew up plans for a signaling device similar to the one pictured in your magazine. But several patent attorneys told me it would never sell, because it might place the liability for an accident on the truck driver who gave the all-clear signal.

MERRITT LETSON, Waterloo, Iowa

How to Deflate a Photographer

The story in your May issue about the rubber airplane [p. 126] was very interesting to me—and also a bit puzzling.

What puzzled me was how the young lady in the pictures got that wing pumped up. The way she had the hose hooked up to the vacuum cleaner, it would suck air out instead of blowing it in. Maybe that's what the man in the picture was trying to point out to her?

DELMER WOLFE, Dravosburg, Pa.

We hope so: Although our caption noted that the vacuum hose would have to be reversed to pump air, the photographer failed

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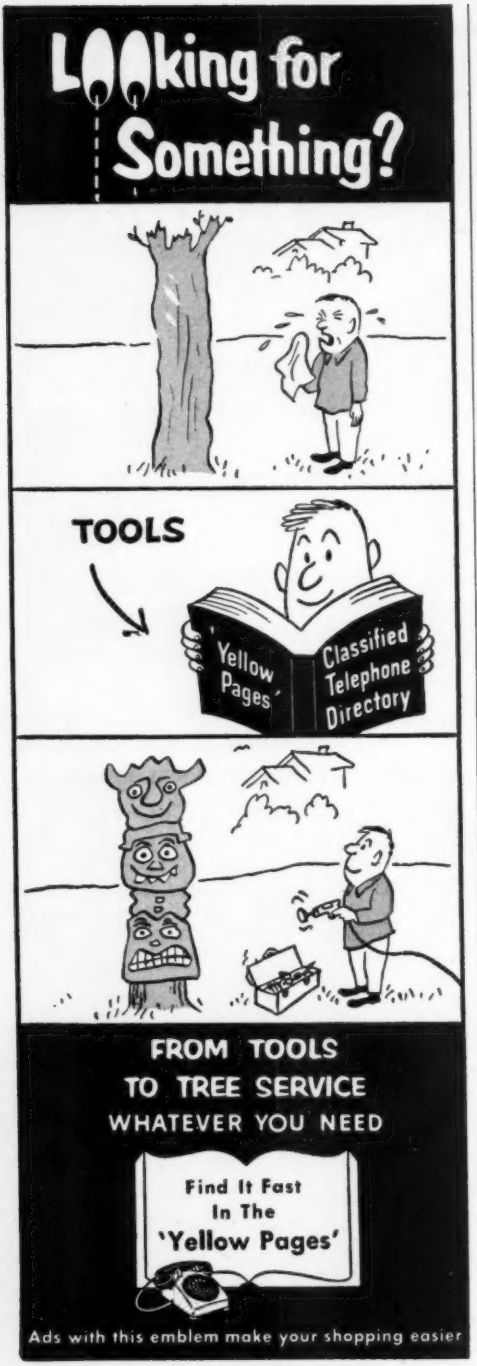

to wait until it had been reversed before snapping his picture.

Don't Put Paint in Milk Cartons

Readers who try your sixth tip for painters [Mar., p. 195, suggesting the use of empty milk cartons to hold small quantities of paint] are likely to get mad at you. Most milk cartons are waxed. If wax dissolves in the paint, the paint won't dry properly.

JOHN CONJURSKE, Rhinelander, Wis.

We slipped on that one. The idea is okay, however, for water-thinned paints, which will not dissolve the wax.

Outboards Still Crank Up

We were happy to see the section devoted to outboards and boats in the March issue [pp. 99-122]. In referring to the Johnson Javelin, however, you say, "they have no manual starters at all."

The Javelin has the same manual starter as other models of the 30 hp. The handle is simply concealed behind a snap plate, readily accessible for emergency use.

DON CULLIMORE
Johnson Motors, Waukegan, Ill.

A good job of concealment—on both Johnson Javelin and Evinrude Lark—got by us.

How Much Vacuum in a Vacuum Tin?

Andrew Pfeiffer is wrong when he says that you can hear air rushing into a can of vacuum-packed coffee as you open the tin ["What's a Vacuum, Pop?" Jan., p. 198]. You hear gases blowing out. There is about four pounds of pressure inside the can.

The pressure inside the can is created by gases coming from the coffee after the can is sealed.

WILLIAM E. ROTH, Bronx, N. Y.

Mr. Pfeiffer and Mr. Roth are both right. There is a vacuum inside the can when it is packed. The coffee does give off gas, but how much depends on the type of coffee, how it was roasted, how it was ground, and the temperature at which the can was stored. So when you open a can you will sometimes hear air rushing in, sometimes gas blowing out.

Only Engineered "Tone" Muffler on the market DYNATONE

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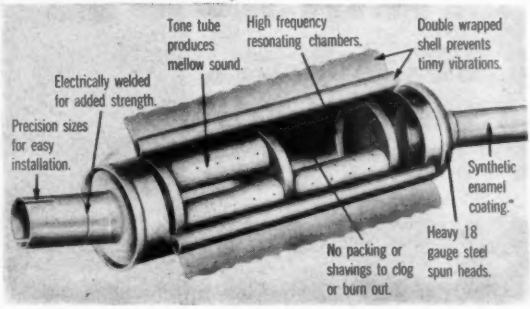
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DYNATONE Dept. 4G Toledo 1, Ohio

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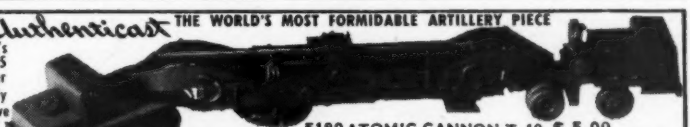

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This is the late Russian Model 7.62 MM Mosin Rifle, appr. 30" barrel. Mechanically perfect. Outside: good. Bore: fair. Ballistics: 2820 FPS with 150 grain bullet. Ammunition available everywhere in U.S., an excellent hunting cartridge. Hinged floor plate. Russian ordnance marks on receiver. The Russians won the International Meet in Venezuela (1954) with this model rifle. These guns were confiscated from Communist revolutionaries and placed on the free world market. They are of the type used by Red Chinese in Korea. The sale of these guns in no way aids any country behind the iron curtain. A Once-In-A-Lifetime collector's item. This is the lowest price we have ever seen which would allow a man to equip himself for big game hunting. For C.O.D. Send $5 deposit. Calif. residents add 4% state tax.

Have *you* recently completed a project of which you are particularly proud? Send a good picture, with the negative and a brief description, to POPULAR SCIENCE MONTHLY's Mechanics and Handicraft Editor, 353 Fourth Ave., New York 10, N. Y. We will pay $10 for each item accepted.

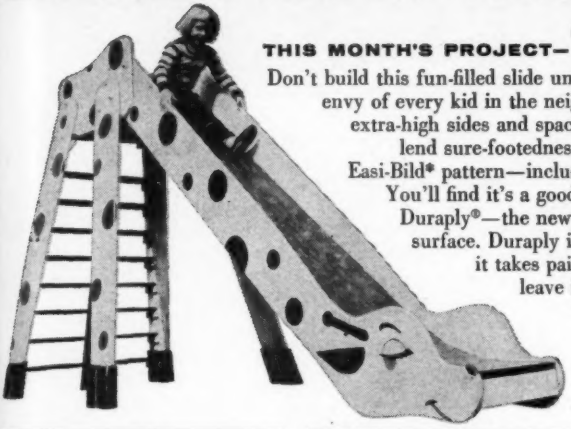
Young Craftsmen At Work . . . on Science Models

Radio Works on Sun Power. Reject photoelectric cells and scrap parts were used by 18-year-old Joe Adams of Cicero, Ill., to make this solar radio. For display purposes, it plays when you turn on the sun lamp.

Model Previews Atomic Power Plant. Gilbert Carlson, senior at Pacific High School in San Bernardino, Calif., constructed this model of the atomic electric station that Consolidated Edison Co. plans for New York City (PSM, Aug. '55, p. 82). It has clear-plastic sections to show some of the inner parts and, Carlson says, "took all the spare time of a couple of months and a large hunk out of a nine-dollar bill."

Earth Satellite Scores in Contest. Sixteen-year-old Ronald M. Egnitz of North Braddock, Pa., displayed his version of the proposed artificial moon (PSM, Jan. p. 124) at the national Science Talent Search. One of 40 high-school seniors in competition, he won a $100 Westinghouse Science Scholarship.

IDEAS FROM WELDWOOD



THIS MONTH'S PROJECT—"JOLLY GIRAFFE" SLIDE

Don't build this fun-filled slide unless you want your children to be the envy of every kid in the neighborhood. The "Jolly Giraffe" Slide's extra-high sides and spacious steps are two safety features that lend sure-footedness to eager young feet. (To get full-size Easi-Bild* pattern—including painting directions—see coupon.) You'll find it's a good idea to build the "Jolly Giraffe" with Duraply®—the new *kind* of plywood with a tough, smooth surface. Duraply is completely weatherproof, and—since it takes paint better and holds it longer—you can leave it outside all year without any damage. Send for the "Jolly Giraffe" pattern today. It will give the kids years of fun . . . it will give you a lot of enjoyment making it.

*Trademark Registered Easi-Bild Pattern Co.

The Weldwood Question Box

Q. I want to put some rough flooring down in my unfinished attic so that I can use it as storage space now . . . with the possibility we'll make a bedroom or two up there later. What should I use for flooring?

A. We aren't just prejudiced when we say use plywood. Weldwood Plyscord means a big saving in time, trouble and money. Plyscord panels are unfinished and unsanded—so they're very economical and just right for flooring. Plyscord comes in widths from 2′ to 4′ and in lengths from 6′ to 10′, so you can easily find just the sizes you need. If your joists are on 16″ centers use ½″ thick Plyscord; if joists are on 2′ centers, use ¾″ Plyscord. Plyscord is ideal for attic flooring because it comes in large sheets and is made with mildew-proof glue. And its strength is greater than even diagonally laid planking. Because Plyscord lies flat, it will make a good subflooring if you decide to put in tile, linoleum or hardwood flooring, later.

Q. Our living room ceiling has a persistent crack that's defied a dozen patching jobs. We've investigated replacing the whole ceiling, but that's much too expensive. Can you suggest something?

A. Yes. Weldtex® squares, which can be attached to low-priced furring strips, will end your cracking and patching troubles. Weldtex has a distinctive striated texture which can be painted or finished natural. Sizes of squares are 11⅜″, 12″, 16″ and 24″. And it's not expensive! Enough Weldtex squares to cover a full 10′ x 12′ ceiling will cost you less than $35.

HAVE A QUESTION?

Send it to "The Weldwood Question Box," 55 West 44th Street, New York 36, N. Y.

This Month's Hints—

CUTTING PLYWOOD:

Hand-sawing a 4′ x 8′ sheet of plywood isn't difficult if you use this trick. Support the panel firmly on chairs or "horses" and, after sawing a foot or so, wedge a screwdriver into the "slot" you've just sawed. This will keep the plywood sections separated and prevent the saw from binding.

Power-sawing plywood . . . or any wood . . . may produce edge-splintering if you cut too fast. To avoid this, use a combination blade that's sharp. If it's important to have perfect results, attach a strip of masking tape to the back of the panel where the saw blade cuts through.

$10 for your ideas

for "This Month's Hints," if accepted for publication. (Hints *must* apply to some Weldwood product.) Send them to "Weldwood Hint Editor," 55 West 44th St., New York 36, N. Y.

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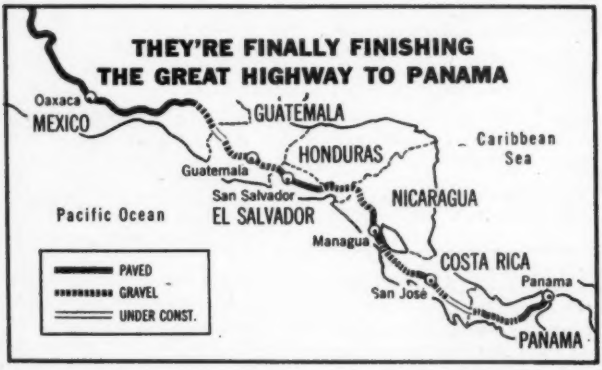
POPULAR SCIENCE MONTHLY

LATE NEWS...

Breakthrough against schizophrenia? Tulane University scientists have extracted from the blood of schizophrenia sufferers a material that, when injected into normal people, made them act mentally ill. (They recovered in a few hours.) The discovery may lead to a "Wassermann test," and eventually an antidote, for schizophrenia, which is a widespread and serious mental disease.

Roadbuilders are completing the gaps in the Inter-American Highway, the 3,250-mile road that climbs rugged mountains, bridges canyons and penetrates wild jungles to connect Laredo, Tex., with Panama City, Panama. With money now available for the last big unbuilt stretch—134 miles in Costa Rica—the road, linking eight nations, is expected to be open from end to end in 1958.



Boy or girl? Doctors can tell now before the baby is born. Three separate groups of physicians—two in the U.S., one in Israel—have correctly predicted sex by examining, under a microscope, cells drawn from the amniotic fluid which surrounds the infant in the mother's womb. Female cells contain a component that male cells do not. The procedure is a tricky one, and of course does not affect the baby's sex, but merely identifies it as a boy or girl.

The fastest "bullets" ever fired will whirl around inside a new six-billion-volt underground atom smasher being planned by Harvard and MIT. The machine will accelerate electrons around a circular path 236 feet in diameter to very nearly the velocity of light. At top speed, the electrons will weigh 12,000 times their normal weight as a result of the conversion of energy into mass. To be built in Cambridge, the machine will be finished in about four years.

"Hot" tools containing a little radioactive cesium 137 are used by workmen assembling McDonnell airplanes. If one is forgotten inside a completed wing, where it might cause damage during flight, it reveals its presence to a scintillation counter. The tools are safe to handle—they emit less radiation than the radium dials on the instrument panel of the plane.

A climate for learning will be engineered into dormitories for the new Colorado Air Force Academy. Two experimental rooms have instruments for measuring conditions that affect human efficiency. Even doorknobs will be tested.

Weather forecasts will sound like racing reports in one Midwestern state. Weathermen, concerned about wording forecasts so that people can understand them better, plan to quote numerical odds. They may say, "The chances of rain are three to one," instead of just, "Rain is likely."

High-school research will be supported by the American Association for the Advancement of Science with cash grants—not prizes—that promising youngsters can use for their own original projects.

Good book. James Dugan has written a fascinating history, *Man Under the Sea* (Harper & Brothers, $5), that describes in exciting detail underwater developments from the first skin divers of 4500 B.C. to Captain Cousteau and the atomic sub *Nautilus*.

POPULAR SCIENCE
REG. U.S. PAT. OFF. Monthly

The Sharpshooter Who Guards the President

By Herbert Yahraes

He's U. E. Baughman, Chief of the U. S. Secret Service, a steely-eyed foe of assassins and counterfeiters. His motto: "You ain't learning nothing when you're talking."

LOOK closely at pictures of the President campaigning this year, and you may notice a tall man with a crew haircut and piercing eyes standing unobtrusively near him.

That will be U. E. Baughman, who fills one of the most responsible jobs in the land—Chief of the United States Secret Service. He fills it so quietly that his name hardly ever reaches the news, and so well that he was recently chosen one of the government's 10 outstanding career employees.

This is Chief Baughman's busy year. As head of the Treasury Department agency charged with protecting the President, he will help the White House plan every campaign trip or other journey. He will be particularly concerned with what routes the President will use, where he will eat and sleep, and the spots from which he will make speeches. Baughman will assign special agents of the Secret Service to each trip and frequently go along himself. He will be ready the night of Tuesday, November 6, to guard not only the President but also the President-elect, in case they happen to be two different men. He will also deal with the abusive and threatening letters that stream into the White

Arrows show Secret Service agents guarding President Eisenhower in inaugural parade, 1953.

House in greater numbers than usual whenever the presidency is in the spotlight.

In between, he will continue to lead the war against counterfeiting and the larger war against the stealing and forging of government checks—perhaps our fastest-growing crime.

The Chief, as associates from the President on down call him, looks like a good man to play a Secret Service agent in the movies. He is a lean six-footer. His eyes are steely and his mouth firm. It's easy to imagine him shooting it out with a counterfeiter in a deserted mansion.

In reality, Baughman has had plenty of adventure. One black night in the Tenderloin section of Philadelphia, for example, he was lounging in an alley, keeping watch on a house into which two counterfeiters had disappeared. Suddenly, from up the alley an engine roared, headlights flashed on, and the counterfeiters' car came bearing down on him.

Baughman, a crack shot, shoved himself against the wall and pulled his revolver. Then as the automobile sped by he put the gun away.

"I didn't want to risk hitting anyone on the street," he explains. "I was sure we would get those fellows eventually, and we did, two days later."

That was the closest he has ever come to firing a gun in line of duty—and he has never been fired at.

About such episodes the Chief says: "There is satisfaction in getting a job

done—any job. But the adventurous part of the life has never appealed to me."

The Secret Service hired Baughman in 1927—five years out of West Philadelphia High—as a clerk-stenographer. He had a night job somewhere else, keeping books, but he soon quit it to prowl around with the agents. And he joined a pistol club. During one busy season his boss lent him a badge so he could go out and make an arrest, and in 1934 Baughman got his own badge.

He can't explain how he's come to the top, but his wife can. "UE has succeeded," she says, "because he is conscientious and not a nine-to-five man."

Baughman stayed in Philadelphia until 1941. Then in rapid succession he was transferred to New York, to Newark, N.J. (long enough to help uncover a ring of 65 people dealing in counterfeit gasoline coupons), back to New York, to Washington, D.C., as supervising agent, again to New York as supervising agent, and finally, on November 29, 1948, back to Washington as Chief.

Since returning to the capital he has:

• Brought together and published under one cover everything an agent needs to know about Secret Service procedure, including how to shadow a suspect and how to write a report.

• Established a special Secret Service school, whose courses include the detection of counterfeit money, the use of all types of firearms, surveillance, photography, and searches and seizures.

• Won permanent legal authority for the Secret Service, which had been operating on a year-to-year basis since 1865.

A slogan posted in the entryway of Baughman's office states one of his convictions: "You ain't learning nothing when you're talking." He also believes that in a job dealing with security, the less said about it, the better the security.

Closemouthed though he is, the Chief, nonetheless, has a warm heart underneath. An expression of this feeling is an organization he founded that permits youngsters who come in to see the Chief to go away with something substantial—a signed card certifying to honorary junior membership in the Secret Service.

GUARDING GENERAL MacARTHUR, a Secret Service agent restrains an over-enthusiastic welcomer in San Francisco upon the wartime Pacific commander's return to his homeland.

BOMB CARRIER was developed by Secret Service to haul away suspicious-looking packages addressed to White House. Agent at left is demonstrating an electrical detection device.

Baughman has a boy of his own—14-year-old Bill. The two usually spend part of Saturday at a rifle range, and in the summer the family goes to Ocean City, Md., for a few weeks of fishing and swimming.

Recently a visitor to Baughman's office brought up a story about Harry S. Truman and the Secret Service. Soon after Mr. Truman was sworn in as President the first time, the story goes, he stepped into a White House washroom and was somewhat annoyed to find two agents following him. "Gentlemen," he is quoted as having said, "in Missouri we wash our hands in private."

Baughman grinned. "I've heard it,

ENLARGEMENTS OF FAKE AND REAL BILLS are examined by the President and Secret Service Chief Baughman at an exhibit in Washington. Unauthorized publication of "illustrations in the likeness of paper money" is forbidden by law. Use of this picture by POPULAR SCIENCE MONTHLY was authorized by Chief Baughman himself. Further reproduction is forbidden.

too," he said, "but I don't believe it. We do our best to protect the President without breathing down his neck."

As an example, members of the Secret Service's White House Detail accompany the President when he plays golf. They go ahead, behind, and on both sides. But they keep a reasonable distance, they are dressed as golfers, and they even carry—as partial concealment for a walkie-talkie—a few clubs.

The most secretive of the Secret Service's work is done by its PRS—the Protective Research Section, headed by Joseph J. Ellis Jr., an intelligence officer during World War II.

All threatening and obscene letters addressed to the President go straight from the White House mailroom to the PRS. So do all other letters about which the mailroom is even a little suspicious.

Baughman emphasizes that the Secret Service never interferes with a person's right to address the President. Of some 19,000 letters referred to it last year, for example, the PRS found reason to investigate only 1,400. Most of these, it discovered, came from people who were just blowing off steam, but some 90 cases warranted action.

Threatening letters are not usually signed, but that doesn't faze the PRS. It notes the postmark, the type of stationery, the style of handwriting, the make of typewriter, and peculiarities in spelling. It also examines phraseology—one man always signed off with "A Mussolini death to you"—and six or eight other characteristics.

Next it tries to identify the letter by matching it against other letters in its files—several hundred thousand, each catalogued according to all these characteristics.

Generally it succeeds, because the person who writes an anomymous threatening letter today has probably written earlier letters—non-threatening but with enough of a screwball tinge to interest the Secret Service—and has signed them.

Of the letters that descended upon President-elect Eisenhower during the last few weeks of 1952, several hundred were from people with what the Secret Service calls a presidential complex—they think that only the President can help them. The PRS identified 92 percent of the writers as people who had also written to Truman, or earlier Presidents.

The Secret Service keeps tabs on "some hundreds" of persons who have voiced threats against the President—usually in a letter but occasionally by walking up to the White House gates, gun in pocket, and demanding admittance. Most of them are now, or have been, in mental hospitals. Every six months, field offices report on them.

When the President makes a campaign trip to Chicago, let's say, an agent from the White House detail goes out in advance to help map travel routes and select guard posts. But first he consults the Protective Research Section and makes note of any so-called "PRS Subjects" from the Chicago area who are not now in an institution. The police will be asked to keep an eye on them.

Almost everything that goes into the White House is examined by the Secret Service. It fluoroscopes all packages before they are brought into the White House and carts off suspicious ones for

[Continued on page 232]

Missile Nose Hitches a Ride on a Jet to Cut Down Cost of Tests

THE big snout of this F-94 jet interceptor, replacing its usual radome nose, is the business end of a guided missile. Guidance systems, telemetering sets and other electronic gear inside it can thus be tested in fast, high-altitude flight. By hitching the parts to a jet, the price of an actual missile's rocket engine—and thousands of man-hours—are saved about every other day at the Air Force Missile Test Center, Florida. And for a bonus, the jet-toted parts are recovered intact.

Miniature Hose Truck Scoots to Fires

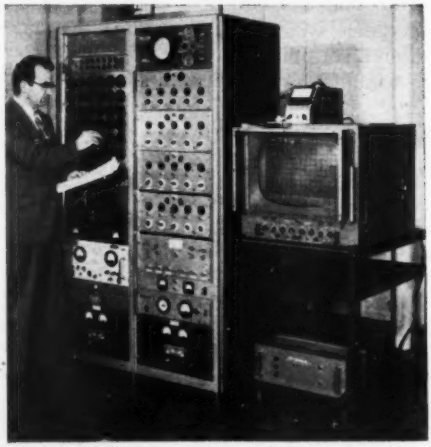
FOUR firemen can ride this midget engine—two standing at back. It's built around a three-wheeled electric scooter. When an alarm is turned in at the Los Angeles plant of U.S. Steel, it heads for the hydrant nearest the fire, couples up its 400-foot hose and moves in. It can even maneuver up and down the aisles of buildings.

Fallout Predictor Maps Danger Zone

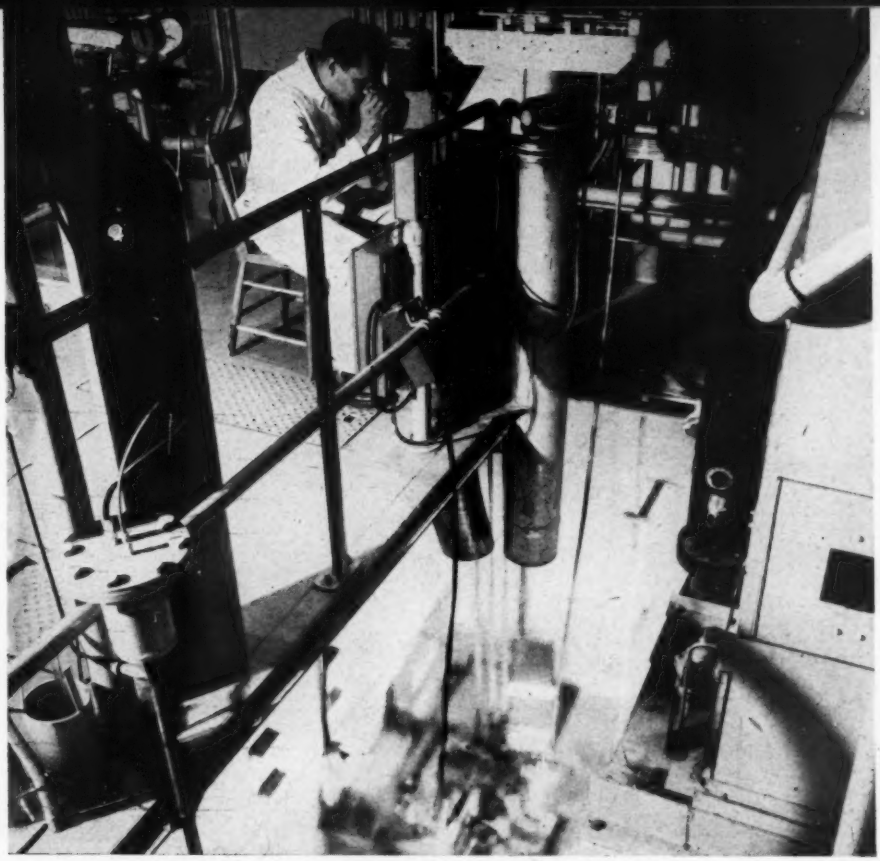
Luminous picture on ruled screen foretells where radioactive dust from bomb (inset) will fall.

WHERE a nuclear bomb's radioactive dust will fall to earth is told at once by a "fallout predictor" developed at the National Bureau of Standards. An operator feeds into it the bomb's characteristics, and wind directions and velocities at various altitudes. Then a glowing picture of the fallout pattern, brightest where radioactivity will be most intense, appears on a TV-like screen. Laying a transparent geographical map over the screen gives a complete fallout map.

Advised by the predictor of shifting winds' effect, a test manager at an atomic proving ground can set off test shots only when fallout will be in a safe direction. In case of atomic attack, the predictor would tell "which way to run" to escape fallout—which may endanger areas far beyond the range of the blast.



KNOBS ON PANEL insert bomb and weather data, and TV-like cabinet shows fallout pattern at once. Predicting it formerly took 15 minutes with high-speed computers, half-hour by hand.



Telephoto Camera Shoots "Hot" Uranium Cylinders in 3-D

A CAMERA with a long lens tube that projects into a protective barrier of water is used to check the fuel for atomic reactors at Hanford plutonium plant. Two shots, taken through the same lens but with the slit shutter placed at different angles to the revolving uranium cylinder, give a 3-D image in a stereo viewer.

Detector Gives Alarm of Nerve-Gas Attack

THIS portable device picks up traces of deadly nerve gas immediately, triggering a buzzer and a warning light. Developed by RCA for the Army Chemical Corps, the detector has a chemically treated tape. If air sucked in by a pump contains nerve gas, the tape discolors. Phototubes react instantly and set off the alarms.

YOU CAN'T PROVE ANYTHING about a sports car on a turnpike, and you shouldn't try. But we had our sights set on some southern Virginia rambling, and this was the shortest route.

ROLLER-COASTING off the Delaware River Memorial Bridge, we began to get the feel of the family sports car. Fury's hair-trigger response was neatly balanced by its roadability.

LAST OUT OF THE WHALE-LIKE MOUTH of a Chesapeake Bay ferry boat, Fury proved no Jonah when we closed with Norfolk traffic. An oversize radiator kept the beefed-up engine running cool during long idling periods.

TWO HORSES PASS 240 HORSEPOWER at historic Williamsburg. The "spokes" on Fury's wheels are just as functional as those on the colonial carriage. They act as cooling vanes for the sports car's big Police Special brakes.

Family

The high point of our 1,000-mile test drive in

Engineered for Dad and prettied up for Mom, Plymouth's 240-hp. Fury is fun for all the family.

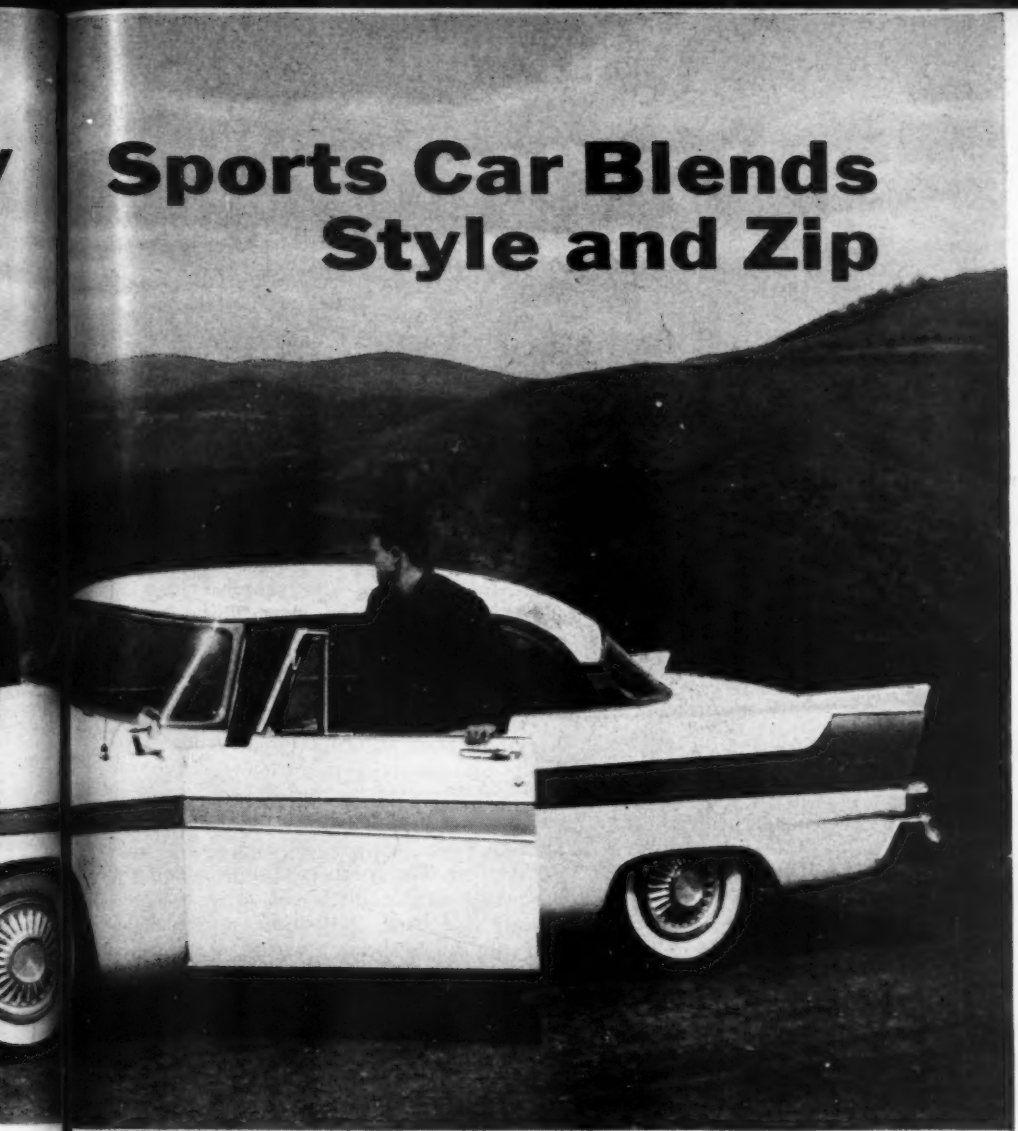
By Henry B. Comstock

PSM PHOTOS BY W. W. MORRIS

EVEN if you have three children and a one-car budget, you can now own a "draggin' wagon."

That's the sales pitch for Plymouth's new "Fury"—a sports car that doubles

Sports Car Blends Style and Zip



a family sports car was the well-poised performance of the Fury on Virginia's Skyline Drive.

as a shapely hardtop for the family.

The Fury has already passed its sales expectancy for 1956. With Dodge's "500," De Soto's "Adventurer" and Studebaker's "Golden Hawk," it may establish the family sports car as a standard showroom item.

How do you reconcile a car that can do a flying mile in less than 30 seconds with the average family man's regard for the health and welfare of his brood?

Granted that he saves his heavy footwork for solo sports events, how happy will he be with creampuff styling?

What are the odds that the little woman won't upshift through a supermarket window when she sets off on the daily missions in a well-tuned sports car?

How is gas consumption on stop-and-go driving? Does its frisky engine hold a tune? On long family trips, how does it stack up against a conventional car for

COMING 'ROUND THE BEND, a front sway bar and heavy-duty shocks and springs put the Fury far ahead of conventional cars. On hairpin turns there's not a trace of nose-heaviness.

comfort? Does its hair-trigger response lure a normally safe driver into a false sense of security?

To find the answers to some of these questions, I recently gave a Plymouth Fury an unconventional road test. Although I carried along a fifth wheel and a stop watch, my main props were my wife and two youngsters, ages five and 17. As a wary old commuter driver I had no intention of trying to duplicate Fury's widely publicized speed and acceleration records. What I wanted was a family reaction to a family sports car.

I drove this Fury a thousand miles in two days. That's a little less than I would normally push our own De Soto on a long haul. But discounting stops and turnarounds for something like 45 photographs, our actual cruising time was considerably less than it would have been in the family buggy. We sampled the Fury on a turnpike, on from bad-to-good flat and roller-coaster roads, over a sizable stretch of Virginia's winding Skyline Drive, and through the heart of Washington, D.C.'s five p.m. traffic rush.

Here's what we found:

Safety. Almost every car the American motorist drives is brisker and more willing than the one he traded in for it. A reasonably adept driver has no trouble adjusting his reflexes to upgraded performance. The same holds for the Fury. Driving it in tune with road conditions, I felt that I might well have my hands on the standard family car of 1960.

I hope so, for the quick-as-thought response of Fury's 240-hp. engine was better balanced with its weight, and deceleration and road-holding qualities than anything I've ever sampled in a conventional family package. This Fury weighed 3,800 pounds. Its big Police Special brakes dragged it down fast and smoothly. There was practically no rock-and-roll on dips and curves that would have mamboed an ordinary car. A lower center of gravity took care of part of that stability. But the big improvement came from Fury's heavy-duty shocks and springs.

Comfort. The sports-car fan accepts a hard ride as his birthright. The Fury doesn't ride hard. If it declines to rock and roll, it also shows a well-bred reluctance to haul off and boot its occupants. I had only to check the rear-vision mirror to see that all was well in the back seat. Chuck holes or no, the old game of "count the horses on your side of the road" went on serenely. The only complaint I heard was that the back-seat leg room was too cramped.

Sports quality. It goes without saying that there will be plenty of Furies in amateur sports-car competition. Most of them will be stripped of their family finery. They will also be fitted out with full race cams, special gear ratios and other hot hardware that has no place in family sports-car driving.

Even the standard Fury is mighty hot for highway use. Sooner or later the joker who lets one out on the open road will find himself draped around a How-

ard Johnson cupola. He will also have violated the whole basic principle of sports-car driving, which is not to beat Grandma's time on the thruway, but to handle an eager car with skill and good judgment under all road conditions.

Speed. With PowerFlite transmission the car whisked our tribe, along with PSM photographer Bill Morris and about 200 pounds of camera equipment and luggage, from a standing start to 60 m.p.h. in 10.8 seconds. It flashed up mountain grades with an enthusiasm that cramped my restraining accelerator foot. It lay flat to the sharpest curves.

There's no doubt about it; you get the sports-car feeling with the Fury. Only my son was dissatisfied.

"Wish we had Fury's stick shift," he grumbled. "Who wants to shift a sports car with typewriter keys?"

Utility. Family sports cars are styled for Mom. Fury's distinguishing decor—it comes only in eggshell white with gold anodized-aluminum side panels—is for the young-at-heart. Yet it retains a chaste enough air for Sunday-school taxiing. My wife went for the cloth-of-gold upholstery. She also liked Fury's performance. As a competent driver she found it a breeze to handle.

Reluctantly, I reminded her that its gas consumption, while good on the open road (15 to 16 miles per gallon), dropped to around 10.5 in stop-and-go traffic. I also pointed out that the engine, which had idled smoothly at the start of our trip, showed mild signs of colic by the time we returned. Fussing with a sports-car engine to keep it at peak performance delights a drag-strip fan, but it could annoy a neophyte.

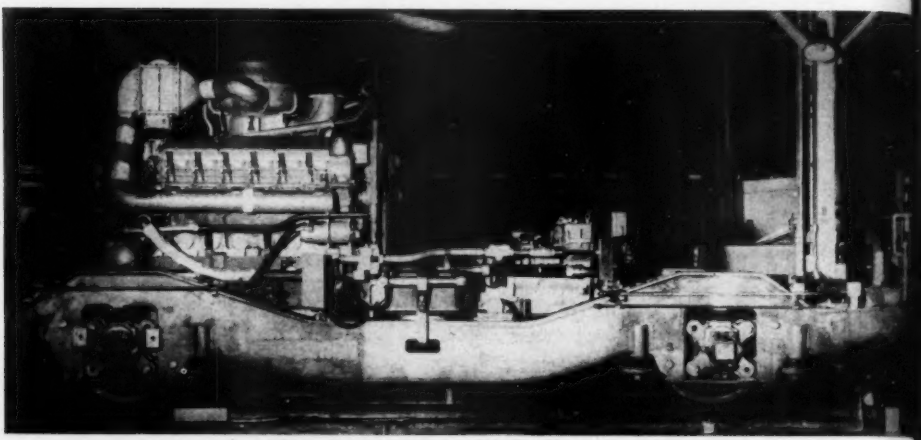
To buy or not to buy? The final decision between a family sports car and a conventional chariot boils down to one of emotion and/or economics. Although it is a bargain package among family sports cars, Plymouth's Fury sells for $2,599, plus accessories, plus taxes, at the factory. That takes it out of the low-price field. If you are both a family man and a sports-car fan on a one-car budget, you'll still find it tempting.

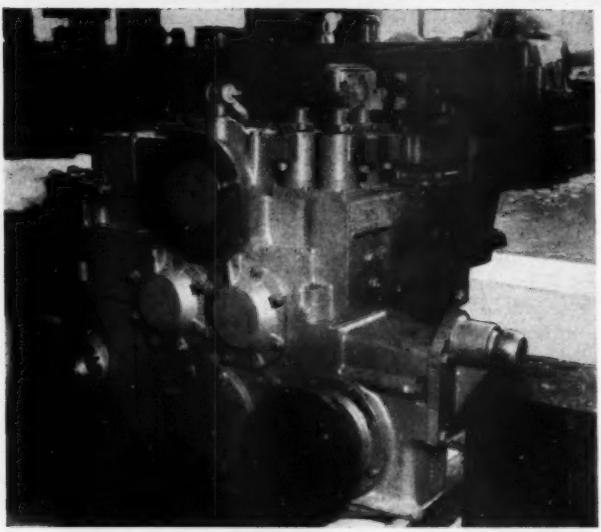
FIFTH WHEEL gave me a chance to check the accuracy of Fury's speedometer. With the needle at 60 we were doing a true 58 m.p.h. That's better than average for dash speedometers.

ACCELERATION WAS BRISK, considering the Fury's 900-pound load—zero to 60 in 10.8 seconds. The tachometer (just to right of steering wheel) climbed lazily to 2,600 r.p.m.

A VETERAN HOOD LIFTER, my son filled me in on Fury's 303-cubic-inch-displacement engine. "This four-barrel carb," he told me, "is bigger than Plymouth's regular power-pack job." END

Diesel Flyer Shifts





12-CYLINDER ENGINE by Maybach is mounted directly on "The Xplorer" locomotive's forward truck, with its power fed through a mechanical-hydraulic transmission box to both sets of wheels. Similar Maybach drives have proved efficient and dependable on German locomotives. With electric controls, any number of such units can be operated from one throttle.

MECHANICAL - HYDRAULIC UNIT is a fully-automatic transmission consisting of a hydraulic torque converter which disengages and synchronizes gear trains for shifting, allowing claw clutches to engage the power smoothly. Electric controls prevent the engineer from throwing the locomotive into reverse until it has come to a complete stop.

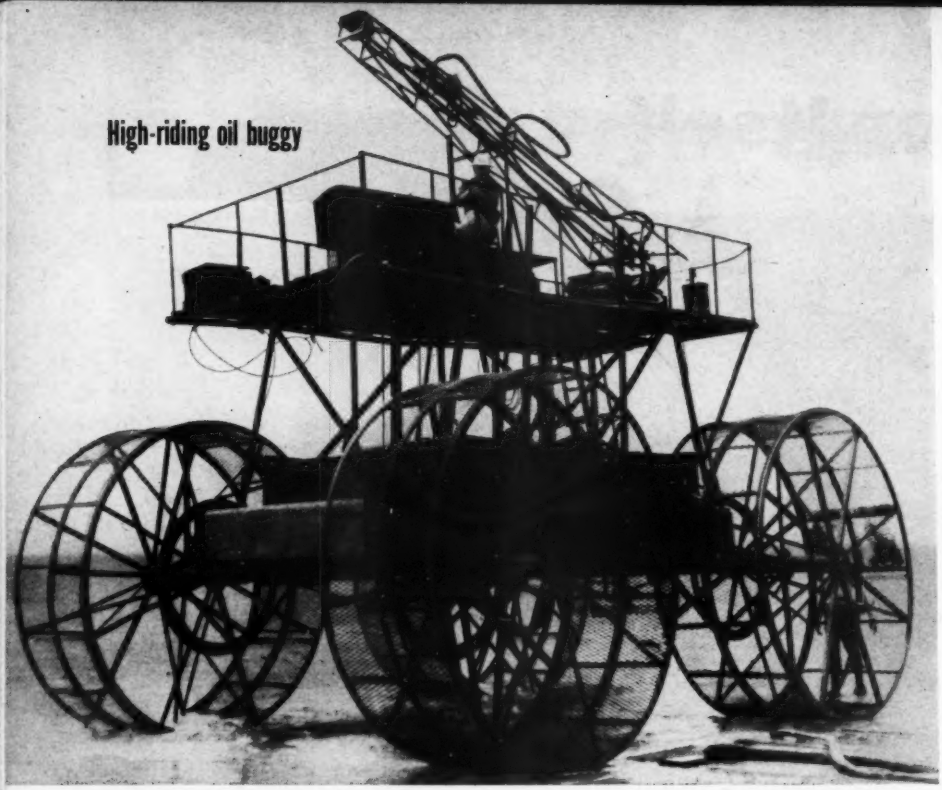
A 120-m.p.h. diesel locomotive with a four-speeds-in-both-directions automatic transmission hustles the New York Central's new lightweight flyer, "The Xplorer," between Cleveland and Cincinnati on daily round-trip schedules.

While smaller mechanical transmissions have been used for industrial switch engines and self-propelled rail cars, this is the first time an American road locomotive has been driven through a gearbox. The engines in conventional diesel road locomotives are coupled to DC generators which feed electric motors geared to the driving axles.

The advantage of the big mechanical-hydraulic transmission unit, which was built by the German diesel-engine builder Maybach, is its low cost as compared to electrical conversion equipment.

for Itself

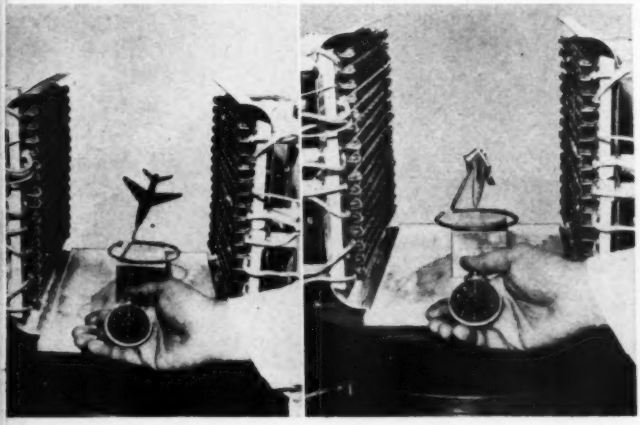
The Xplorer locomotive's "shark nose" identifies it as a Baldwin-Lima-Hamilton product.



Ferris-Wheeled Vehicle Wades in Search of Underwater Oil

SCIENTIFIC exploration for rich oil fields lying below the Gulf of Mexico extends to lagoons and tidal flats close ashore. Specially built for the job is this high-riding buggy that can roam in water 18 feet deep. Tanks at axle level are filled with water to give stability, or emptied for short "swims." The amphibian supplements marsh-prowling "cats" and boats that sound the Gulf depths.

Heat Can Melt an Airplane, Say Scientists—and Prove It



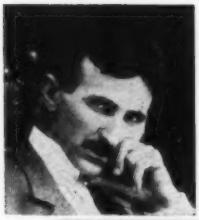
WHAT might happen to today's planes at the high friction-heat temperatures of tomorrow's hypersonic speeds is shown in this test, made by Northrop Aircraft engineers who are developing new metal alloys.

The model (far left), made of standard metal, is flanked by infrared quartz lamps that generate temperatures as high as 2,000 degrees F. The heat is turned on, and seven seconds later the model droops like wet dishrag (near left).

Science celebrates 100th anniversary of

Mr. Tesla, who made work easier

By Gardner Soule



THE eyes of this man—Nikola Tesla (left)—saw the world of the covered wagon, into which he was born, turn into today's world of electricity, radio, and electronics, all within his lifetime. Other men also saw the change—and marveled at it. Tesla was not amazed: He planned it. He engineered it.

This month, engineering and scientific societies observe the 100th anniversary of the birth of this man who changed the world. Tesla was born about the time that sailing ships reached their peak—in the clippers. Before he was 40, he had invented the AC motor and long-distance transmission of electric power. By these two things alone, he made thousands of jobs easier everywhere—at home and at work. He also discovered many principles of radio and electronics. And even thought that he could broadcast power (as radio and TV are broadcast today).

Tesla about 40, at the height of his powers, is shown in the upper photo; in the lower portrait, he is near 80. Because of the vast change he made in the world, Tesla may be said, as much as anyone, to have "invented" Today. His life and work are shown on this and the next four pages.

1856 Nikola Tesla was born at midnight, July 9-10, in Smiljan, Croatia (now part of Yugoslavia). Little is known of his father. His mother could not read or write. But she could use her mind: She recited dozens of long poems and mechanically improved such household items as churns. Nikola showed flashes of scientific intuition from his early boyhood.

1857-60 In a world where 25 men scrounged a living with their muscles for every one who made a living any other way, Nikola, before he was five, played with another source of power. The use of wheels to harness water power was as old as history. From the disk of a tree trunk he made one, set it up as shown and watched as the current's force turned it.

1850s-60s In America, some men hauled carts by hand from the Missouri River to Salt Lake. Horses worked just as hard: The Pony Express raced mail from St. Joseph, Mo., to San Francisco in 10 days. In Croatia, Nikola, seven, saw a fire engine that wouldn't pump water. Intuitively, he diagnosed the trouble. He dived into the river and unkinked the hose.

1865 The world struggled with a new power —inefficient, dirty, hissing steam. In four years men would complete (by hand) a track across the U. S. Tesla, nine, struggled with another power: He made a tiny windmill, glued four June bugs to the blades. Their beating wings turned the blades, and a spindle. He dreamed of a 100-bugpower machine but never built it.

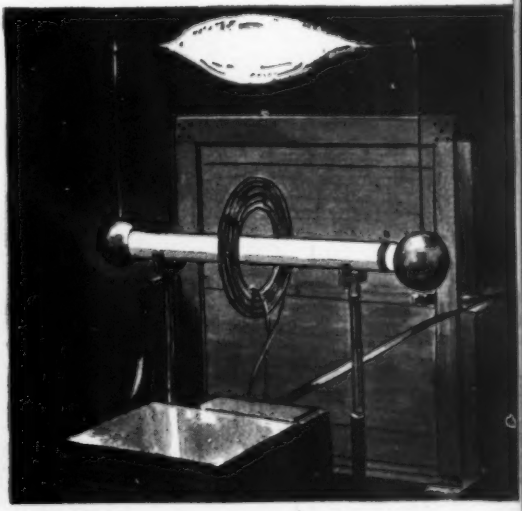
1884 "No more will men be slaves to hard tasks," Tesla said. "My motor will set them free." But no one would give him financial backing. He sailed to the U.S., lost his baggage, his model—all but four cents. But of all the 518,592 immigrants who arrived in '84, he would change the country most. His mind carried all the plans for making it possible.

1885-87 Tesla met and worked for Edison. But Edison was no readier for AC than Europe had been. The arguments were vigorous. Tesla and Edison described each other's mentality as low. Tesla quit his job with the inventor. Soon he was reduced to the drudgery that the world was full of. He became a day laborer and went to work as a ditchdigger.

1866-80 Steam power spread. An engine reached Croatia. Nikola, about 14, saw it—the first man-made source of power he had ever seen. He also saw a snowball, rolling downhill, become an avalanche. He noted that accumulated ounces of snow had turned into a great, moving power. He saw a picture of Niagara Falls, and said, "Some day I'll harness that."

1882-83 After Thomas Edison opened his first plant—DC—to light lamps of his 59 nearby customers, the world grew dimly aware of the wonders of electricity. In Europe, Tesla, 25, thought that electricity could also provide power. Needed: an AC motor, thought to be as impossible as perpetual motion. He dreamed up the plans and made a model. It ran.

1888 Suddenly Tesla hit the jackpot. He got patents on his AC motor and impressed the American Institute of Electrical Engineers (this month celebrating his 100th birthday) with a lecture which explained his idea. George Westinghouse, a competitor of the famous Edison, gave Tesla, the recent ditchdigger, a million dollars for the patent rights to his motor.



1889-90 Working together, Westinghouse and Tesla soon evolved AC motors and dynamos of many sizes. Tesla built a high-voltage coil—the Tesla coil—that with one end inert, the other spouting thousands of volts, would light lamps placed on the other side of the room—without using wires. This was the beginning of his attempts to broadcast power.

1892 To concentrate on work, Tesla ruled out romance. If his discoveries looked impossible in those days of warring Indians, skinny-tired bicycles, and horsecar commuting, he did something—for a man—which was considered more impossible. The "divine" actress, Sarah Bernhardt, dropped her handkerchief before him. He returned it—without saying a word.

1893 The big shows were the late P. T. Barnum's, Buffalo Bill's, Sarah Bernhardt's and —at the World's Columbian Exposition—Little Egypt dancing the hoochee-coochee. Westinghouse and Tesla lighted and powered the Exposition, an accomplishment that finally sold the doubting U. S. on AC. Tesla himself lighted glass tubes without using any wires.

1899-1900 Tesla thought that the earth was electrically charged. (It is.) At Colorado Springs, he set up a plant that would add to the earth's charge so you could plug in anywhere and get electricity. He pumped power in, claimed to draw it back—creating lightning. Unfortunately, he never wrote down the details of his experiments for future reference.

1901-16 At a time when radio consisted only of dot-dash messages, Tesla set out to build, on Long Island, N. Y., a radio city that would broadcast both power and all the kinds of programs that are known to such widespread audiences today. Tesla never got around to broadcasting either. But he did discover many fundamentals of radio. Then he went broke.

1895-96 Westinghouse and Tesla put on their biggest show. They built a powerhouse at Niagara Falls. General Electric, with Tesla methods, built a 22-mile transmission line to Buffalo. This was a significant advance. Edison had delivered power about a mile. Here power went from one area to another. The age of sending power far and wide had dawned.

1898 The U. S.'s Admiral George Dewey licked the Spaniards in Manila Bay. Tesla, at Madison Square Garden, put a boat equipped with radio in a tank of water. From afar, he started, steered, and lighted the vessel—by radio. It was, he said, the first of a race of robots that would fight—operated by remote control—in the future wars of the world.

1920s-30s Growing old, Tesla withdrew even more into himself. This man, who was responsible for every AC motor (162 million horsepower when he died), and every transmission tower and line, kept his blinds closed—except during storms. Then he would throw open his windows, lie down on a couch and watch the lightning dance across the sky.

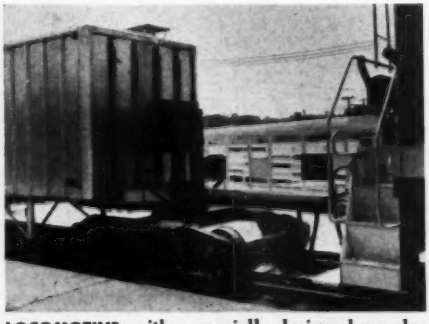
1930s-40s The world last saw Tesla on the steps of the New York Public Library. He had found a love: Daily he fed the pigeons. The man who had made work easier for millions all over the world was the old man whom unknowing thousands saw feeding the pigeons. On January 7, 1943, at 86, Nikola Tesla died alone in a New York hotel room. END

LOOKING LIKE ANY OTHER BOXCARS, except for rear doors to facilitate truck platform loading, 29-foot Railvan sections can be quickly assembled into trains for long rail hauls.

AS SPEEDILY DISASSEMBLED and hooked to standard tractors, each unit becomes a truck trailer for flexible distribution to widely scattered customers at railroad terminal points.

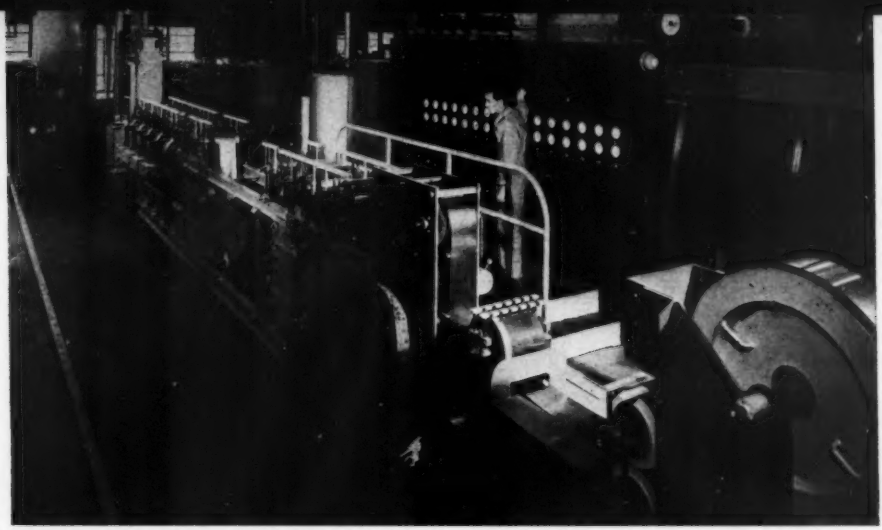
Boxcar Turns into Truck Trailer

A FREIGHT car with both rail wheels and highway tires, whose positions can be reversed in 30 seconds, is now undergoing railway tests. Operating singly as truck trailers pulled by any standard tractor, Railvan units were designed by the Chesapeake & Ohio to compete with truckers for terminal pickup and delivery business. Operating as conventional freight trains, the front of each boxcar rides piggyback on the car ahead, with the lead car on a special link.



LOCOMOTIVE, with a specially designed coupler installed above a standard coupler, backs onto the lead unit like a truck tractor.

ARMS SUPPORTING BOTH SETS of wheels are attached to outer casing of Goodrich torsilastic springs. Air motor reverses wheels' position.



TIN PLATE FOR CANS will roll out of this machine. It's a small-scale electrolytic tinning line in U.S. Steel's new laboratory. The finished cans will be packed with real food for tests.

Miniature Steel Industry Built to Aid Science

SMALL coke ovens, blast furnaces and machines to make both tin cans and structural steel will be used for research purposes in the U.S. Steel Corporation's new laboratory at Monroeville, Pa. It is the largest such laboratory in the country, and the 500 scientists, engineers and technicians employed there will be able to duplicate, in miniature, processes used in the nation's most up-to-date mines, mills and factories.

In addition to developing new products and processes, the staff will tackle projects in pure science. There will be a greater emphasis on seeking knowledge for its own sake, company heads say.

PLASTIC BLAST-FURNACE MODELS like the one shown above will be used to investigate the flow of solids and gases in a furnace.

COAL CAN BE EVALUATED in experimental coke ovens like this one, from which more than 300 pounds of coke is being pushed.

90-Foot Eyes on Wheels Will Locate Radio Stars

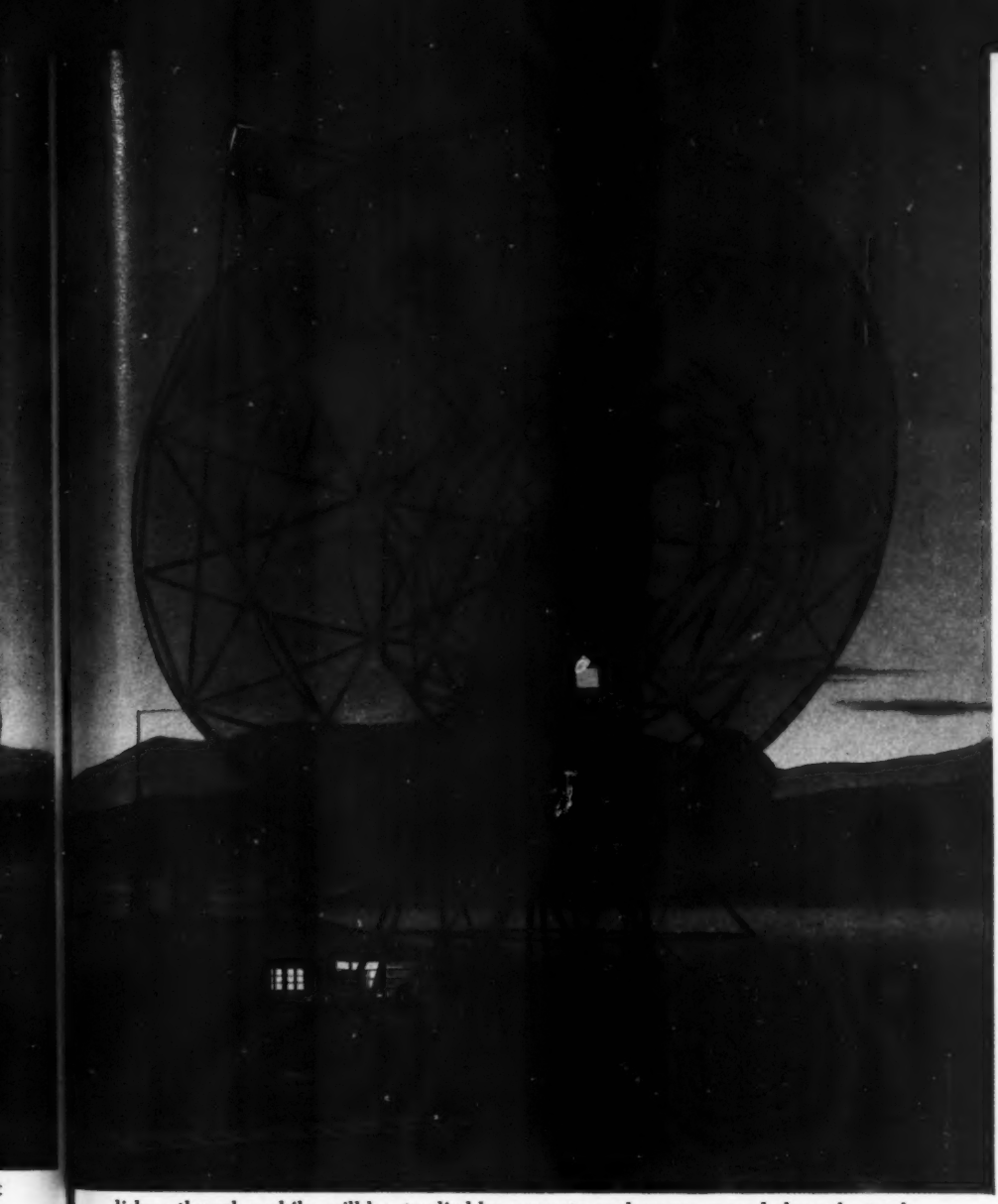
This painting shows the 75-kilowatt radio telescope to be built in California. Its giant

Biggest steerable telescope in Western Hemisphere will scan the sky for signals from space.

By Wesley S. Griswold

ON THE lofty floor of California's Owens Valley, a relatively narrow path between two of the nation's highest mountain ranges, work has begun on a grotesque-looking device that will be the biggest steerable radio telescope in the Western Hemisphere.

"Steerable" means that it can be aimed at its targets—more than 2,000 mysterious stars that have revealed their existence in outer space by emitting radio waves. Scarcely any of them can be seen with the naked eye. Only a few have been seen with optical telescopes.



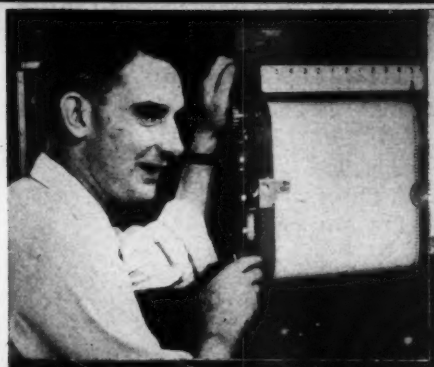
dishes, though mobile, will be steadied by concrete anchorages spaced along the tracks.

This radio telescope may discover more radio stars. Its primary purpose, however, will be to locate more accurately those that already have been found. Then big optical telescopes may be able to find them and take photographs of them.

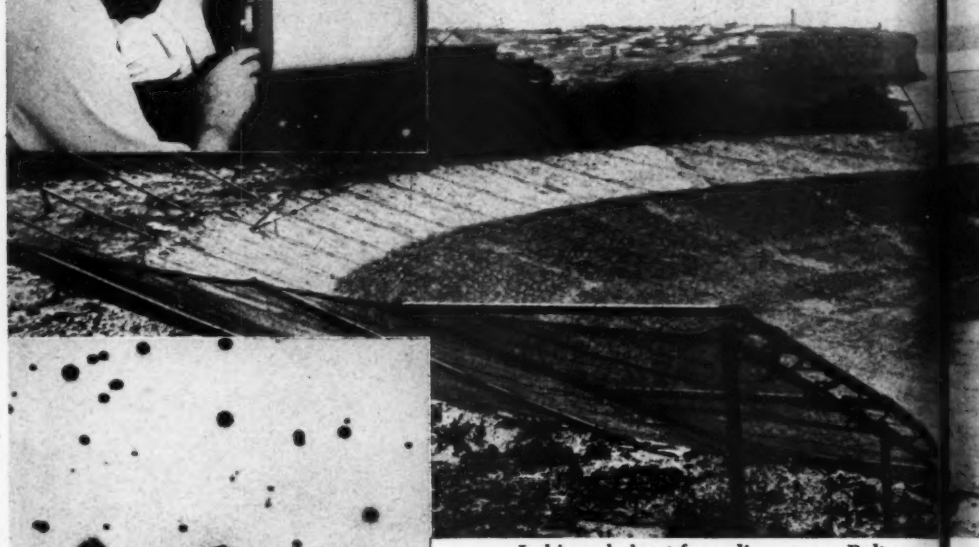
Another important mission will be to try to determine what produces the strange radio waves.

It can also be used to probe the electrified layers, a few hundred miles above the earth, through which artificial satellites will soon be traveling. Irregularities in those layers make radio stars "twinkle" just as the atmosphere causes visible stars to sparkle, and this may make it difficult to track the satellites.

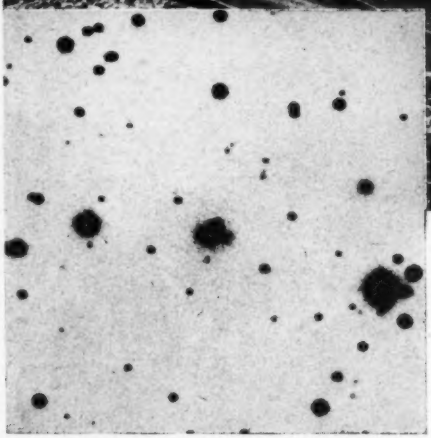
This will be the most versatile radio telescope in the New World. It will be-



YOUTHFUL PIONEER in the science of radio astronomy, John G. Bolton, 34, was only 25 when he discovered the first radio star. Its signals were recorded on a meter like this one (left).



In his early hunt for radio sources, Bolton



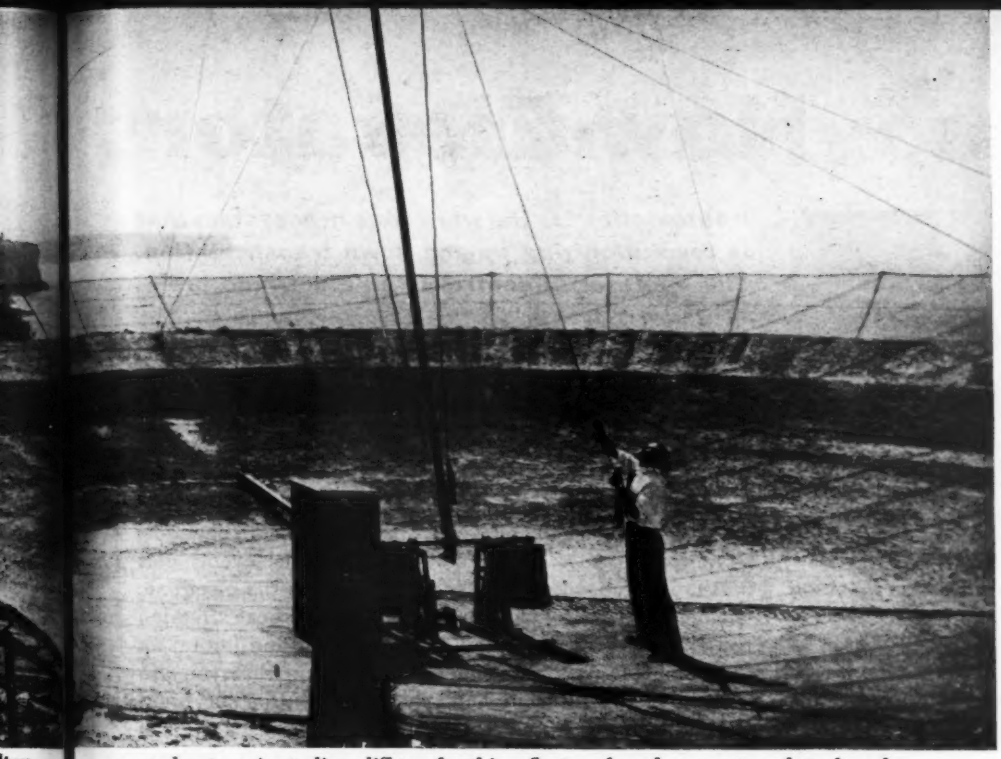
TWO GALAXIES COLLIDING 60,000,000 light years away, and shown in the center of this photo taken with the 200-inch Mt. Palomar telescope, are the source of the first radio star found.

long to the California Institute of Technology. Harvard has the biggest radio telescope now in use in this country—a 60-foot parabolic "dish," and more such telescopes will soon be built. President Eisenhower, for example, recently asked Congress for $3,500,000 for another, 140-foot radio telescope.

The Owens Valley radio telescope will be completed sometime in the spring of 1957—in time to join the great battery of scientific instruments mobilized for the International Geophysical Year. It will consist largely of a pair of huge, shallow bowls of webbed steel, 90 feet across and weighing 10 to 15 tons apiece. Each bowl will be lined with a reflecting mesh of expanded aluminum.

These bowls, mounted on wide bases, will travel back and forth on wheels along two sections of track, which will meet at right angles. One section will run for 2,000 feet due east and west. The other, meeting it on the north side, will stretch 1,600 feet north and south. The rails of each track will be set 40 feet apart, to accommodate the broad bases of the bowls.

Angled at the sky, the bowls will revolve, while a slender, barbed antenna —a prickly lance, 36 feet long—protrudes from the center of each bowl to probe unknown portions of the universe. Each bowl-and-base combination will weigh 50 to 60 tons. By being able to move the twin bowls several thousand feet apart for certain observations, the operators of the Owens Valley telescope will achieve the effect of having a single bowl three-quarters of a mile in diameter (PSM, July '54, p. 78).



scooped out an Australian cliff top for this reflector of sand, concrete and steel mesh.

The chief designer of the Owens Valley radio telescope is John G. Bolton, a young man who is already a renowned pioneer in radio astronomy, a science even younger than he is. A slender, rather frail-looking Englishman of 34, with dark hair and eyes, Bolton was co-discoverer of the first six radio stars known to man. Though he holds no academic degree higher than the bachelor's degree in physics that Cambridge University conferred upon him in 1942, he directs Caltech's program of research in radio astronomy. It's a job that keeps him on the move, shuttling between Mt. Palomar, 100 miles south of Pasadena, and the Owens Valley installation, 250 miles north.

He thinks it is ironically amusing that he was pushed by circumstances into the fields of both radio and astronomy, and that his imposed career is in a branch of astronomy whose devotees hardly ever have occasion to look at the sky.

Electrical and radio interference are their chief worries. That is the principal reason why Bolton selected the remote Owens Valley site for Caltech's big radio telescope (a smaller one, also designed by him, has just been built on Mt. Palomar). The distant valley seems likely to remain free of obtrusive signals from TV transmitters, electric razors, automotive ignitions, diathermy machines and the like for the foreseeable future.

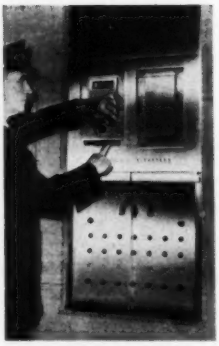
The war nudged Bolton, a physicist, into radio and radar work, and the process of getting demobilized landed him in radio astronomy, 12,000 miles away from home.

He was in the Philippines when the war ended, and, given a choice of places to be demobilized, he selected Australia, which he had liked from the first time he saw it. Within 24 hours of shedding his uniform, Bolton was given a job in Sydney by E. G. Bowen, head of the Radio Physics Division of the Commonwealth Scientific and Industrial Research Organization.

"The CSIRO does 80 percent of all the

[Continued on page 236]

Now Elevators



Lobby attendant is turning up volume on intercom that enables him, in case of emergency, to talk to the passengers in one or all the cars. For operation of the elevators, an attendant is not needed once the type of schedule, such as Up Peak or Down Peak, has been dialed on the selector, shown below.

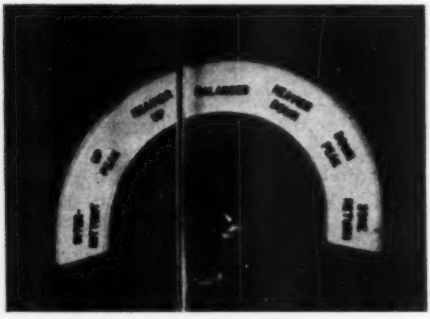
"Automatics" is the word for a new system that is revolutionizing up-and-down transportation. The operator in control is an electronic brain.

By J. D. Ratcliff

NEW trains, planes and automobiles get splashy receptions. But there has been equally dazzling progress with another vehicle—one that carries 85 times as many passengers as all railroads, 850 times as many as all airlines. The vehicle: the elevator.

Step into one of the new high-speed, automatic, operatorless models and a series of near-miraculous events gets under way—all unseen, all as remarkable as the electronic wonders that take place in a plane cockpit. Scales hidden in the floor of the car react to your weight and inform an electronic brain in the top of the building that you are aboard. If you forget to push your floor button the brain waits a polite interval. Then a "phantom voice" reminds you. A message comes through the speaker in the car: "This is an automatic elevator. Push your floor button, please."

As the doors begin to close, another passenger tries to squeeze through. The doors bounce back instantly without touching him. Supersensitive electronic tubes in the leading edge of the door have picked up feeble currents given off by the human body. The doors can approach no closer than four inches, then they automatically reverse.



Traffic patterns are preset. "Zone Return" divides building into upper and lower zones, sending half the cars to serve each.

You reach your destination, say the seventh floor. The phantom voice announces: "Engineering department of the A. B. Smith Co." Perhaps you tarry in the doorway to speak to a friend boarding the car. The electronic brain becomes impatient. "Stand back from the door, please," the voice says. "You are delaying the car." If you *still* stand in the doorway, the brain takes action. It orders the doors to close with slow deliberation, nudging you out of the way.

The pioneer phantom voice was installed last summer in New York City at the National Distillers Building, 99 Park Avenue. It calls off a variety of messages, such as "This car

up," or "This car down." It announces floors and names of major tenants. If someone inadvertently pushes the red emergency button, the speaker advises: "If you pushed the emergency button by mistake pull it out again. If not, you may talk to an engineer through the car speaker."

Such messages, carried on magnetic tapes or drums, can provide any type of information. In Southern department stores they will list merchandise found on each floor, speaking, of course, in a Dixie drawl. In Boston hotels they will call out the floors with a New England twang; in a Des Moines business building the voice will speak with a Midwestern accent.

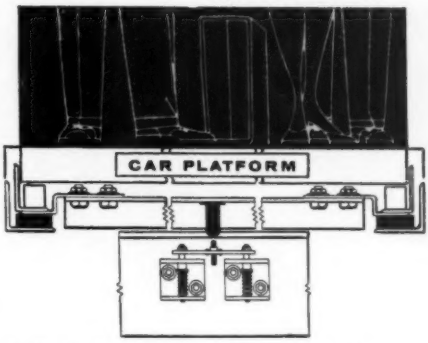
Modern high-speed automatics are simple to operate even for the person who has never been in one before. They aren't to be confused with the small push-button elevators installed in apartment houses as far back as 1894. In early models the first person to push a button was in command of the car. In today's automatics an electronic brain supervises the operations. It makes split-second decisions in bossing whole banks of elevators, as in the 41-story Prudential Life Building in Chicago, or the vast new Socony-Mobil Building in New York, the largest commercial structure built in Manhattan in a quarter of a century.

The electronic brain that governs automatic elevator operation is, in effect, an electronic calculator. Basic information feeds into it: weight of the load in the car; the number and direction of corridor calls; the number and direction of button pushes in cars; positions of cars along shaftways; the length of time that people have waited in hallways.

From this data, the brain decides the kind of traffic pattern the system faces. There are six basic ones. Among them: up-peak (when people go to work in the morning); heavier-down (when people begin to go out for coffee breaks); intermittent (at night when there are few calls). Each traffic pattern calls for a different *type* of elevator scheduling if maximum service is to be provided.

At up-peak periods cars are dispatched as soon as the floor scales say they are loaded. If the top passenger is for the ninth floor in a 12-story building, the car goes to that

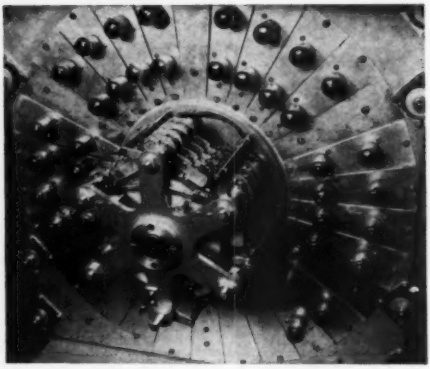
Built-in sense speeds service



Electronic gadgets mastermind the automatic elevators. A load-weighing device under floor (above) dispatches full cars on their way, causes a car to skip calls when there is no more room.

The little black box being installed here senses rate of acceleration so that riders don't get that "sinking" sensation.

Elevator voice is human touch



Up to 34 different messages can be electronically recorded on this rotating drum and piped to individual elevator cars that are equipped with loudspeakers.

Penthouse control room of automatics resembles "brain" of electronic calculator, which it is.

point, then reverses. People waiting in the lobby are favored.

If, during the down-peak period at five o'clock, scales report that the car is fully loaded at the top floor, it goes nonstop to the lobby. At the same time, the brain doesn't forget people waiting on intermediate floors. It may even "zone" the building, assigning half the cars to upper floors, half to lower floors. As demand shifts, the zone level can be moved either upward or downward.

The electronic brain, ever thoughtful, doesn't neglect the lone bell pusher who has been passed by a number of loaded cars. Surveys have shown that, on the average, people are content to wait 17 seconds. They become impatient after that, and frankly mad after 35 seconds. If the brain notes that a single passenger has been waiting too long, it dispatches a car to pick him up.

The brain also sees to it that cars don't "bunch"—all at the top of the shafts, or all at the bottom. In midmorning when up and down calls are about evenly balanced, the cars run up and down at uniform intervals and remain evenly spaced.

At night, when the building goes to sleep, the brain dispatches all cars to the first floor and thoughtfully turns out lights and shuts down motor-generator equipment to save power. But it is always ready to go into instant action at the break-up of a late-night business conference.

Today's spectacular automatics are the culmination of a long series of advances. Early elevators were merchandise hoists lifted by hemp ropes. They were considered unsafe for passenger use until Elisha Graves Otis invented a protective rachet device that prevented falls. He startled audiences by demonstrating the safety device, successfully, at New York's Crystal Palace Exposition in 1854—rising to the top of the building and having the rope cut with an ax.

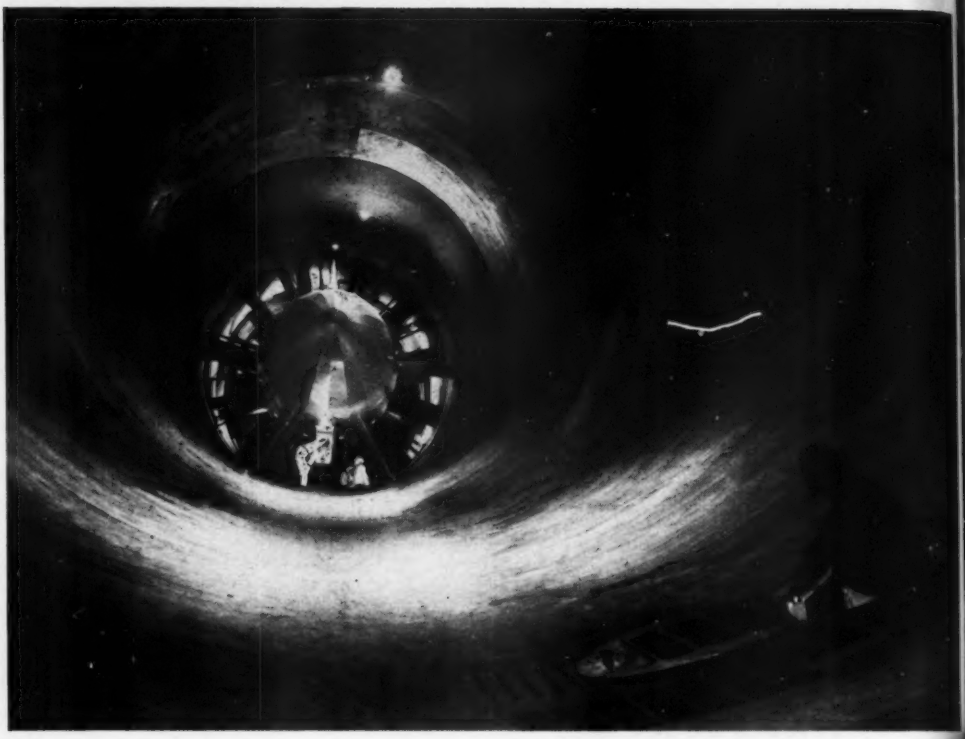
Early models of the "safety hoister" or "vertical railway" were bizarre. One had a threaded screw running the length of the shaft. As the screw turned through a nut in the floor of the car, the elevator rose. Another depended on a large counterweight containing a water bucket. At the top of the shaft the bucket filled. As it fell, it hoisted the car. At the bottom of the shaft the bucket emptied and the car could

[Continued on page 228]

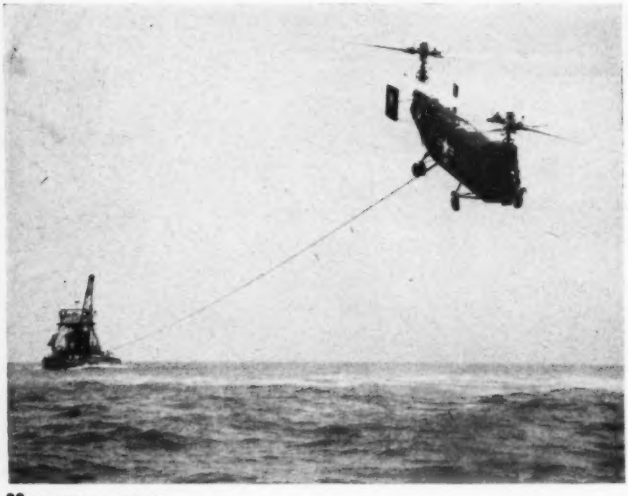
1,500-M.P.H. Missiles Supersonic guided missiles are now riding with jet interceptors, such as this Navy Chance Vought Cutlass, that operate from our big aircraft carriers. The rocket-propelled Sparrow hits a speed of more than 1,500 miles an hour within seconds after launching. A beam-riding guidance system enables it to seek out a target.

Seaplane Tester Spray patterns of hull models are among the studies that are being made at Convair's new 300-foot-long towing tank at San Diego, Calif. Models of advanced seaplane hulls under test are pulled through the water at 68 miles an hour by a carriage on overhead rails.

For more picture news in aviation, please turn the page

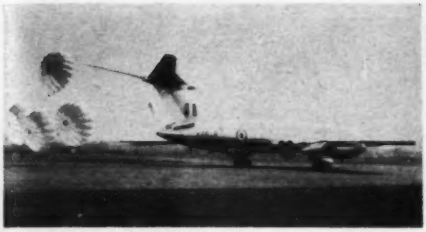


Windier Tunnel Blasts of nearly twice the speed of sound are now blowing through the recently beefed-up Southern California Cooperative Wind Tunnel at Pasadena. Huge fans at rear can be pitched for subsonic, transonic or supersonic blows. Manhole is for entry into the tunnel.



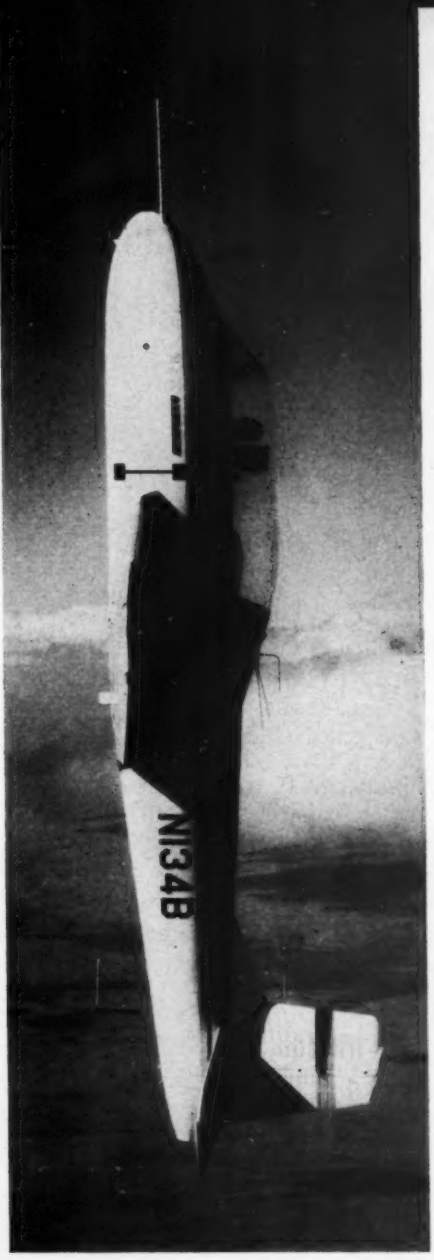
Helicopter Tug

A Navy HSL-1 copter is shown at left towing a 300-ton floating salvage derrick. Reason for the recent demonstration was to prove that the powerful tandem-rotored Bell whirlybird, a modified version of an anti-submarine helicopter, can serve as an aerial mine sweeper. It would reduce danger to personnel and equipment.

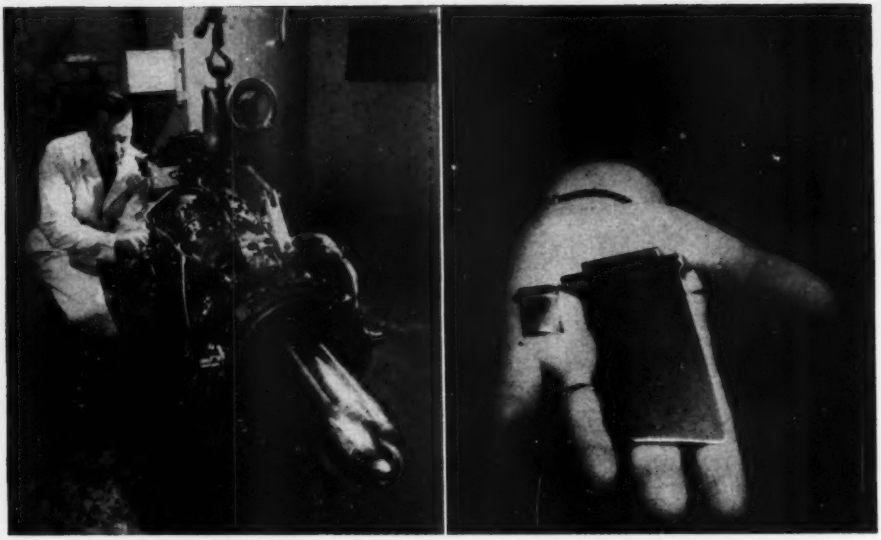


Big Air Brakes Four drag parachutes are released to slow down the landing run of Britain's new Handley Page Victor—a four-jet strategic bomber designed for long range and high altitude at near-sonic speeds. Performance details are still secret.

Cocooned Jets Looking like dummy planes (below), these are some of our fastest Air Force jet fighters. They are loaded on the flight deck of the aircraft carrier USS *Tripoli*, ready for transport to overseas bases. Their odd look comes from a coating applied to protect them from salt-water spray. Flight-weary jets are returned to this country in the same way for overhaul.



Straight Up A training plane isn't expected to reach for the sky like this, but with test pilot Tom Gillespie at the controls the Beechcraft Jet Mentor shows off its high performance. The new Air Force 295-mile-an-hour, single-jet trainer has tandem seating for instructor and student.



Small Gas Turbine Will Give Powerful Twist to Twirlybirds

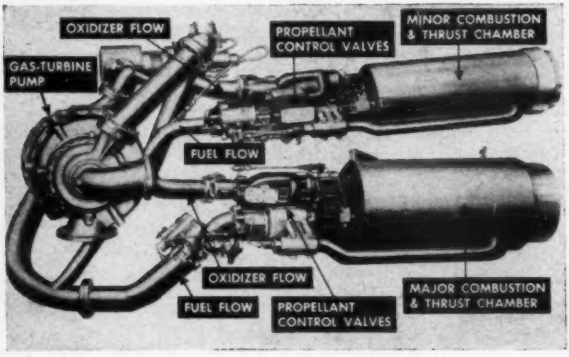
ALTHOUGH weighing only 325 pounds, a new turboshaft engine developed by General Electric delivers more than 1,000 hp. This better than three-to-one ratio of the T58 compares with one hp. per pound of weight for most piston engines used in helicopters. In performance, says GE, this would give a copter the ability to stay aloft 50 percent longer, or to double its payload.

The engine, which is less than five feet long and 16 inches in diameter, has jewelry-size compressor blades. They weigh only one-fifth of an ounce each. One is shown at left in the photo above beside a blade from a big jet engine.

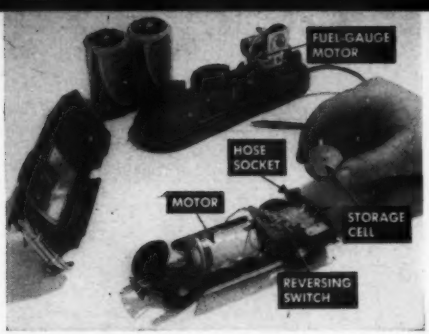
Throttle for Rocket Engine Lets Pilot Control Its Power

ONE trouble with adapting rocket engines to manned aircraft is that the pilot has little or no control over his power. Once the fuel is ignited, it burns unrestrained until exhausted.

Recently Curtiss-Wright announced "the first rocket engine which can be throttled up or down by the pilot." Although no details have been announced, this drawing, which shows two combustion-thrust chambers, makes it possible to risk a guess that it works something like this: The pilot valves propellants (fuel and oxidizer) into the minor chamber alone for "low" power; uses the major chamber alone for "medium" power; turns both on to deliver "full" power.



The new throttle-control rocket engine which is used in the X-2 Air Force supersonic experimental plane is said to pack as much power as a Navy cruiser.



DWARFING THE CELL that gives it power, the motor is built inside-out; its field magnet is inside the rotating armature. A second ordinary motor in the charging circuit drives the gas-pump gauge. The D-size flashlight cells are said to allow up to 50 hours' actual operation of the toy auto.

Toy Car Runs on Storage Cell

ELECTRICALLY driven, this toy car is actually refueled from the little gas station shown. A gauge needle on the gas pump spins realistically when the hose is pushed into a filler opening in the car.

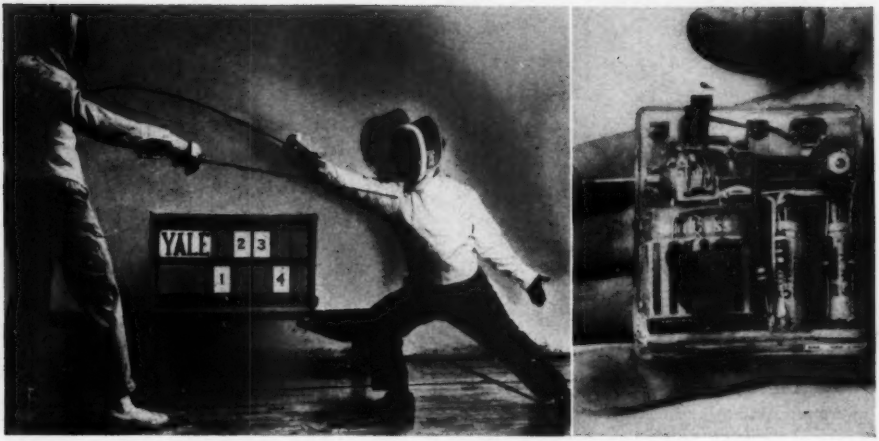
But it is electricity, not gas, that flows into the car. Supplied by two flashlight cells in the station, it recharges a nickel-cadmium cell about the size of a quarter. This will run the car for about twice as long as the time it is charged.

Hermetically sealed, the 1¼-volt cell is leakproof and can be charged an indefinite number of times. Unharmed by overcharging or by being left discharged, it has a top charging rate of 360 ma., and a capacity of 150 ma.-hours.

A special low-drain motor in the car draws only 150 ma. under normal load. Its wound drum armature turns in ball bearings outside a permanent-magnet field. Priced at about $6, the outfit is imported from West Germany by Louis Marx & Co., Inc., of New York City.

Table in Car Trunk Rolls Out for Picnics

EVERYTHING for eating by the side of the road rolls out of the trunk of this car. The table pulls out on rails for use, rolls back again for quick storage. Under it are stored a spare tire, tools and two padded seats that hook on the bumper. Helen Armitage, California maker of miniature music-box furniture, designed the rollaway unit.



Electronic Scorer Calls "Touché" on Flashing Foils

EVERY time one of the Yale fencers above makes a point, the scoreboard registers it electronically. Each man carries a radio transmitter (above right) wired down his arm to the foil. Pressure on the point of the blade causes the transmitter to send out a radio wave to one of two receivers on the scoreboard.

Paper Clothes Block Out Rays, Keep Off Rain

THESE men are wearing disposable coveralls made of K-2000, an experimental, paperlike fabric. Nonwoven, the material is a web of threads—rayon, nylon or glass—bonded with adhesive. Laminations of cellulose wadding build in toughness, and radiation-, water- and wrinkle-resistance.

Dresses, skirts, rain wear and bathing suits of K-2000 are undergoing tests, too. Kimberly-Clark Corp., Neenah, Wis., says it can be cut like paper, sewed like cloth, and heat-sealed like plastic.

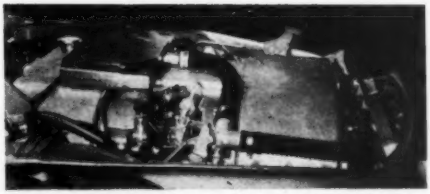
Free-Piston Engine Tried in Car

LATEST of the never-never cars to be pushed out of the General Motors styling studio is the XP-500 pictured here. Among its other wonders is a free-piston engine. This is a form of internal-combustion power plant that is a way station on the road to a pure gas turbine.

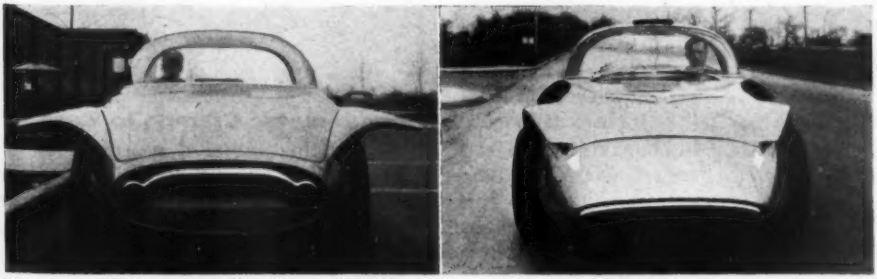
Conceived more than 30 years ago, the free-piston engine has had considerable development in England, France and Switzerland, mainly as a prime mover in stationary power plants and in ships. Combustion takes place between pairs of pistons free to bounce outward against cushions of trapped air; power is obtained by conducting exhaust gases, plus air compressed by piston movement, to a turbine.

Like true gas turbines, it isn't finicky about fuel—experimental engines have run on such offbeat hydrocarbons as whale and peanut oil. One big advantage is the dilution of exhaust gases by compressed air, which means that turbine blades need not spin in destructively high temperatures.

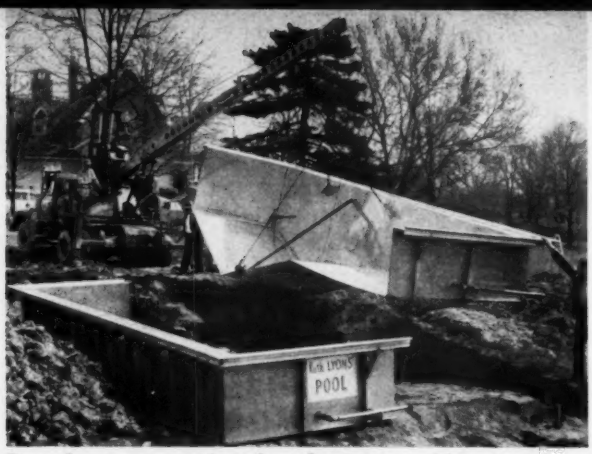
GM spokesmen do not foresee commercial highway use for five to 10 years.



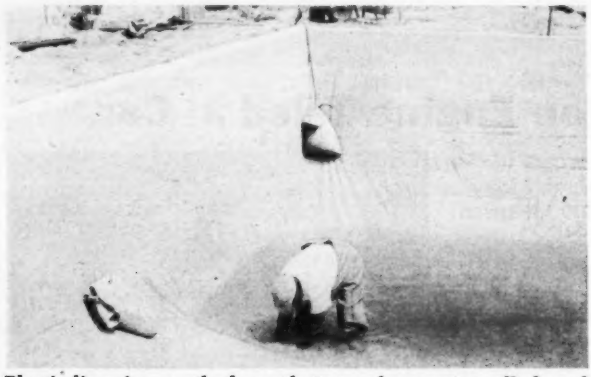
ONLY A PART of the power plant is under the hood. The power turbine is at the rear wheels.



Going or coming, the free-piston car looks as if it could put its 250 horsepower to good use.



Crane lowers one section of an aluminum pool into excavation.



Plastic liner is smoothed over bottom of concrete-walled pool.

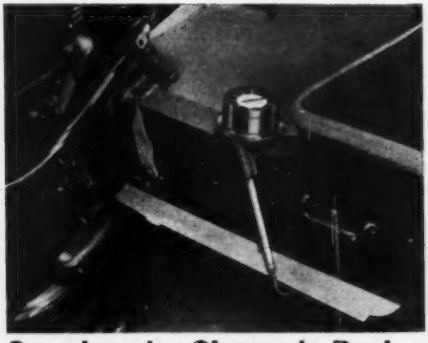
Newest Pools Go in Faster, Cost Less

You can have a prefab pool of aluminum trucked into your back yard on Wednesday and be swimming in it by the weekend. The two sections are lifted by a crane, dropped into the prepared excavation and welded together. Smallest pool installed by the Chester Products Co., Hamilton, Ohio, is 16 by 32 feet. It's tagged at about $3,800 without the filter.

Another quickie is a plastic-lined pool that is basically just four concrete walls. Davis Products, Inc., Santa Monica, Calif., can build one, hook up filter and plumbing, and tamp in the liner for under $2,000. And the surface never needs painting.

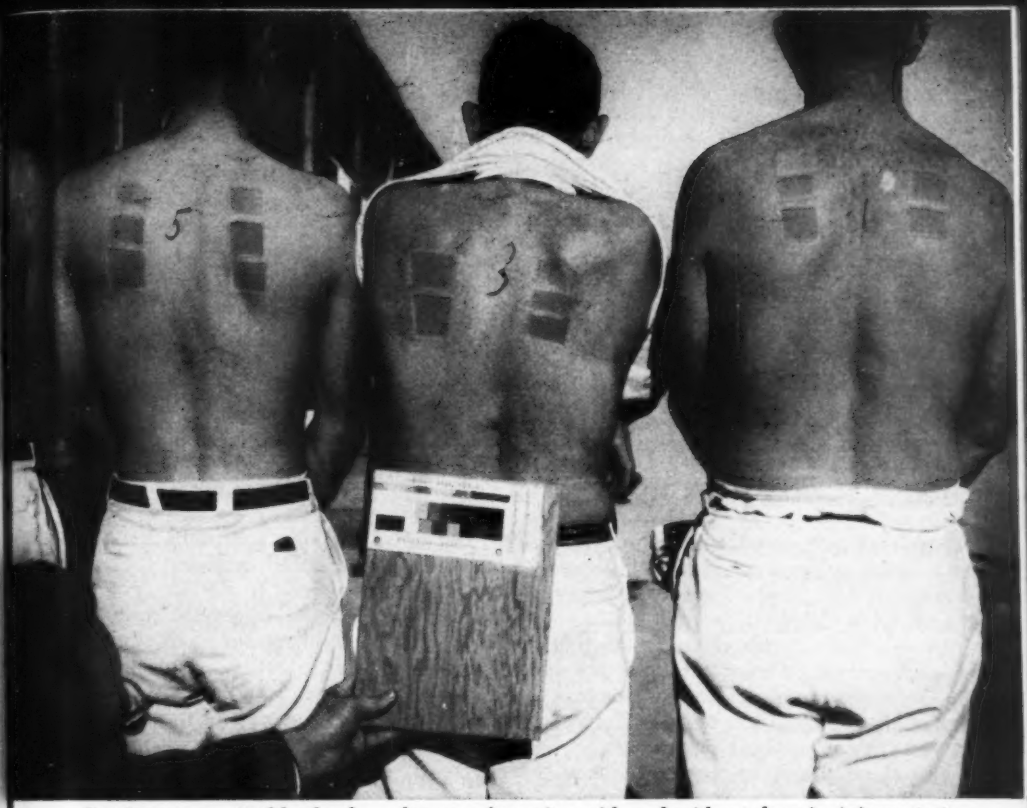
Head Lamp Leaves Hands Free

You can shed light on the scene and still keep both hands free for handling a rod or a wrench when you slip this Head-Lite around your noggin. It weighs only three ounces, works off a six-volt belt-hung battery. Eveready makes it.



Speedometer Clamps to Boat

Clamp this outboard speedometer to a boat and it pokes a Pitot tube under water. Airguide of Chicago explains that it converts water pressures to speed readings which show up on a dial almost uniformly calibrated for all speeds.



Patches on convicts' backs show degrees of tanning with and without drug in Arizona test.

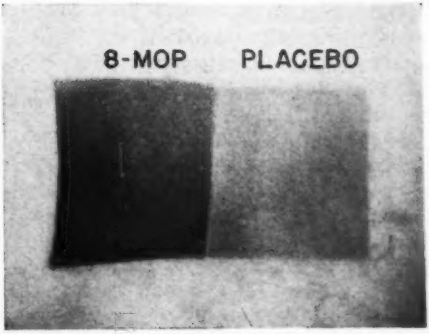
Take a Powder: Get a Suntan

Soon almost everyone can wear a lifeguard look, experiments with a new drug seem to show.

NEXT summer, something you swallow, rather than something you rub on your body, may turn you the color of a lifeguard when you stretch out in the sun.

That goes even for those of you who now burn and peel, with nothing to show for your torture, or who merely look liverish after a two-week vacation.

It appears likely that a fine mahogany hue for all, except a wretched few who are truly allergic to sunshine, may be obtained in as short a time as three days. The process will be simple: Down an in-



HOW DRUG HELPED one girl to increase her tanning capacity is shown in left-hand patch. It is the result of one 30-mg. capsule of 8-MOP, one hour of sunning on three separate days. The other patch shows her normal tan, when taking placebos (dummy pills) with same exposure.

PREPARING FOR A MASS TRIAL of 8-MOP, medical researchers sort out pieces of adhesive tape for the backs of their subjects, drug capsules and capsules containing a drugless powder.

SHIELDED BY OILCLOTH except in openings where patches of adhesive tape are alternated to obtain test patterns of tan, this Arizona prisoner enjoys the sun in the interests of science.

expensive white capsule after breakfast each morning, wait a couple of hours, don shorts and let the sun have its way for an hour.

Hope for the eventual success of this effortless recipe for getting to look like a child of nature in jig time arises from experiments being conducted by University of Oregon medical researchers.

For three years, at first as a semi-scientific pastime shared with friends and acquaintances, lately in carefully controlled field trials, these researchers have been assaying the suntan-inducing qualities of a drug called 8-MethOxyPsoralen. It quickly won the abbreviated nickname of "8-MOP."

The drug was extracted from the seeds of the ammi majus plant in 1947 by two Egyptian pharmacologists. Ammi majus grows in numerous places in the Middle East, but especially along the banks of the Nile, where it flourishes as a weed.

Many centuries ago, Egyptians with an ailment called vitiligo (pronounced vitt-le-*eye*-go), which causes white blotches to appear on the skin, discovered that they could produce gratifying results by rubbing the blotches with the leaves of this plant. Great blisters soon rose where they had rubbed; but they endured these stoically, for they had found that when the blisters healed, the blotches on their skins were noticeably darker.

That crude first step toward a panacea for twentieth-century sun worshippers remained the only step until 1947. Since then, with 8-MOP extracted from ammi majus and refined to a white crystalline powder, doctors in several countries have been trying it out in treating vitiligo. This skin disease, especially common in Egypt and India, exists in the U. S., too. In the process of trying to find an effective treatment for it, Dr. Thomas B. Fitzpatrick and fellow researchers at the University of Oregon stumbled upon the course of experimentation that seems destined to win them the gratitude of this nation of sunbathers.

One of Dr. Fitzpatrick's vitiligo patients a few years ago was a young lady whose white blotches were darkening satisfactorily as she continued to take 8-MOP capsules but whose surrounding skin was browning even more markedly. The doctor was struck with the thought that if 8-MOP could bring about such striking results on skin that he wasn't trying to darken, it might be just the ticket for people who have difficulty getting a good suntan.

The first tests were made on himself and his research team, and then on friends whom they could trust to use the drug with caution. These early tests were made without the controls that are necessary to prove a drug's worth scientifically. But they were excitingly encouraging.

One of the most enthusiastic early samplers of 8-MOP was Harold A. Miller, a very fair-skinned Portland,

LENDING SCIENCE A HAND, these inmates at Arizona State Prison were given capsules of 8-MOP and, on alternate days, capsules of a drugless powder, to test the drug's suntanning power.

CHECKING THE RESULTS on the backs of inmates at Arizona State Prison, a medical researcher examines the varying shades of tan made by the sun when aided by 8-MOP and when not aided.

Ore., lumber executive, who previously had burned miserably whenever he tried for a tan. Three years ago, he set off for a Caribbean vacation with a bottle of 8-MOP capsules and instructions from Dr. Fitzpatrick. He returned so handsomely bronzed and grateful that he donated $4,500 for further experiments.

Since then, Mr. Miller says, he has had similar success with 8-MOP in the Bahamas and Hawaii as well as at home in Oregon, with never a painful burn.

Although it is already on the market in very limited amounts under the name Oxsoralen, it cannot be obtained except by prescription and used under a doctor's direction.

Sunbathers wouldn't worry so much about the sun if it weren't so ultraviolent.

—THE SIDEWALK SUPERINTENDENT

"It is very powerful stuff," says Dr. Carl E. Hopkins, one of the experimenters. "The more of it you take, the more severe the burn, if you also are exposed to a given amount of sunshine."

Actually, according to the research team, the drug should be called a sunburn aid rather than a suntan aid. It increases the burning effect of the sun on the user's skin, and he gets a quicker, deeper tan as a secondary result.

Thorough tests have proved that it is not toxic, and there have not been any undesirable side effects in those taking it. "But we need to do a good many more laboratory trials," declares Dr. Farrington Daniels Jr., another member of the research team, "before we can be sure it is as effective as it gives promise of being."

For one thing, the researchers do not yet know everything about the way the drug works. They do know, however, that it causes the body to step up its normal production of skin pigmentation.

Three mass trials of 8-MOP, involving from 30 to 50 people at a time, have already been conducted under strictly controlled conditions. One was run off in Hawaii. In another, inmates at the Arizona State Prison who volunteered for the trials were paid $5 a day apiece to sun themselves on the prison baseball diamond. They all had an ideal pallor to start with, for their backs had not been exposed to the sun for the previous six months. The results were impressive.

Still another field trial is taking place this summer, financed by a grant from the U. S. Public Health Service.

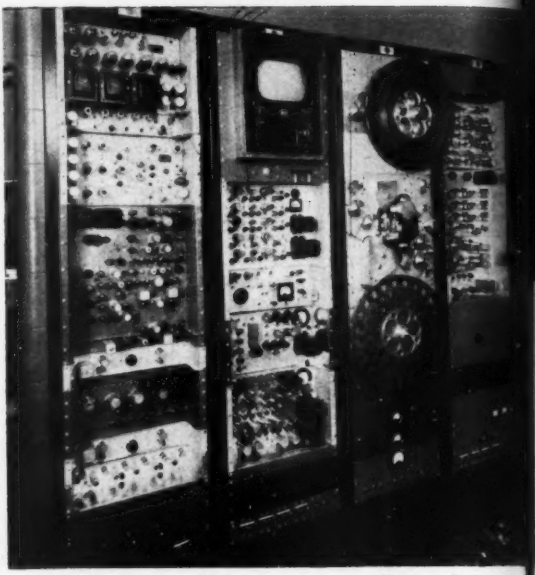
The potential benefits are far more important than the mere gratification of sunbathers. It is possible that 8-MOP may reduce the incidence of skin cancer among people who have to work in intense sunshine. And it could prove to be a godsend to those downed at sea and forced to drift in open boats under the searing sun.—*Wesley S. Griswold.*

Now They Put TV on Tape

SOON you'll be watching tape-recorded TV. To "can" programs for deferred telecasting, major networks are testing two new systems that record pictures, as well as sound, on magnetic tape. Better picture quality is expected than with movie-film TV recordings—plus the advantages of economy, and immediate playback.

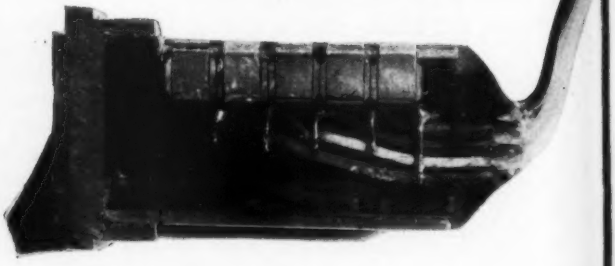
Color TV goes on half-inch tape whizzing at 20 feet a second, in a Radio Corporation of America system. Black-and-white TV is put on two-inch tape at 15 inches a second by Ampex Corporation apparatus. Picture and sound tracks use separate magnetic heads in both systems.

Possibilities beyond telecasting are foreseen. One of these days you may put rented reels of TV tape on a home reproducer for entertainment. Ultimately "electronic photography" may replace film with tape for both home and commercial movie-making.—*Alden P. Armagnac.*

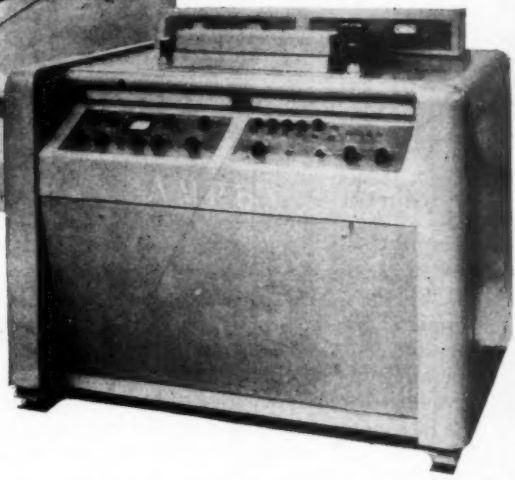


RCA SYSTEM runs TV tape over recording and reproducing magnetic heads between reels on this panel. Starting and adjusting the high-speed precision mechanism takes a quarter-minute.

TINY MAGNET, below pencil point, is key feature. High resolution demands poles with least possible gap, so these actually touch. Video magnetic head, shown intact and halved, has five of these magnets.

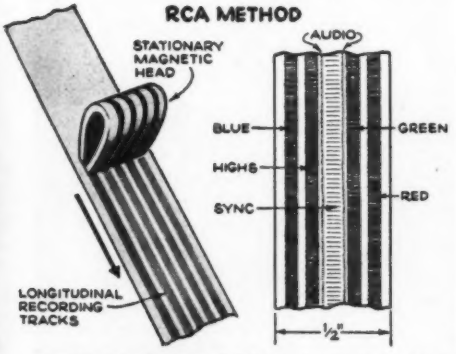


TAPE REELS atop Ampex cabinet flank the rotating magnetic-head unit (below raised cover) that crams required amount of picture information on tape. Press one button, and the cabinet will record a TV program; press another button and the apparatus will play it back.

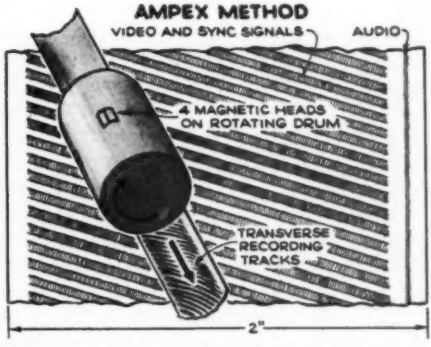


AMPEX SYSTEM is housed in the compact cabinet at right. Networks have ordered 13 of these units, reported to cost $75,000 apiece. Despite the present high price, a model like this may give a preview of a future home reproducer that could be hooked to standard TV receiver to play your choice of rented reels of TV tape.

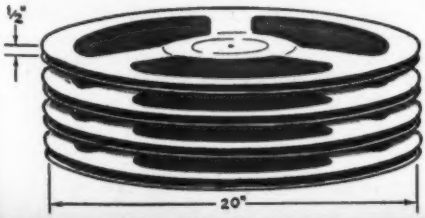
How the Two Systems Work

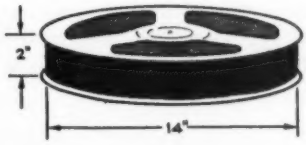


ON NARROW TAPE of RCA color system, seven tracks run lengthwise. Twenty-foot-a-second tape speed is set by minimum travel of tape—.015 in.—in which magnetic head can record one horizontal line of multi-line TV picture. One-hour program takes four reels shown below.



ON WIDE TAPE of Ampex black-and-white system, rotating heads apply picture tracks crosswise. This plan, and simpler task of recording black-and-white than color, permit moderate tape speed of 15 inches a second. One-hour program goes on one reel shown below.





A retired engineering professor and his wife, working in their basement shop, have harnessed an old idea to a new job.

Hot-Air Engine May Cool Your House

By Martin Mann

FOR 150 years inventors have been tinkering with the intriguing hot-air engine. Now it looks as if this simple engine has found a job, one that may put it in homes across the country: operating air conditioners.

A lone inventor working in a shop in the basement of his home is responsible. He is O. A. Carnahan—no amateur mechanic, but a retired professor from Syracuse University.

Professor Carnahan has completely reworked the basic hot-air engine, retaining its simplicity while increasing its adaptability and efficiency. He has used modern materials and engineering techniques to get the most power from his machine. Theoretically, he calculates, it should run at 40 to 50 percent efficiency, remarkably good for any kind of heat engine.

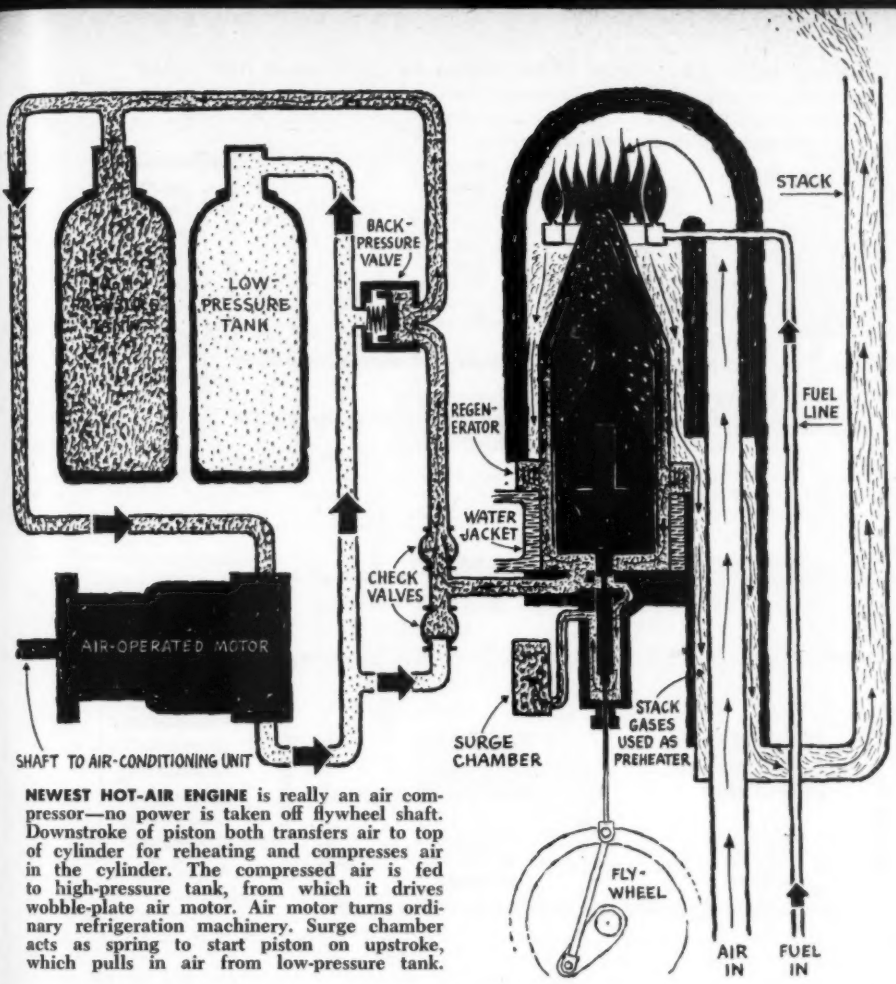
And he has switched the engine around into an air compressor. There is a turning shaft, but no power is taken off it.

The man who has done these things is slight, spry, his hair white and thin. But his clear blue eyes are sharp, his sense of humor in excellent working order. And he is very, very wise in the ways of exploiting the laws of thermodynamics to engineering advantage.

Professor Carnahan retired from the University after 27 years as professor of mechanical engineering. "Too old to work any more," he says. Now he only works at two jobs. He is design consultant for a foundry (its president is a former student), and is perfecting his hot-air engine for the Coleman Co. (the gasoline-lantern firm, whose engineering v-p was also a Carnahan student).

Mom Carnahan is the only assistant. She is a lively, young-looking woman who seems prouder of her skill as a lathe hand than of her master's degree in home economics. During World War

WORKING MODEL chuffs quietly as inventor, Prof. O. A. Carnahan, records meter readings. New versions, now being built for test with air conditioners, will have several cylinders.



NEWEST HOT-AIR ENGINE is really an air compressor—no power is taken off flywheel shaft. Downstroke of piston both transfers air to top of cylinder for reheating and compresses air in the cylinder. The compressed air is fed to high-pressure tank, from which it drives wobble-plate air motor. Air motor turns ordinary refrigeration machinery. Surge chamber acts as spring to start piston on upstroke, which pulls in air from low-pressure tank.

II she made more than 100,000 brass bushings on the basement-shop lathe for a local defense plant. Made her own jigs and fixtures, too.

When Professor Carnahan conceived the idea of redesigning the old hot-air engine into a modern air compressor, he thought primarily of making an automobile engine.

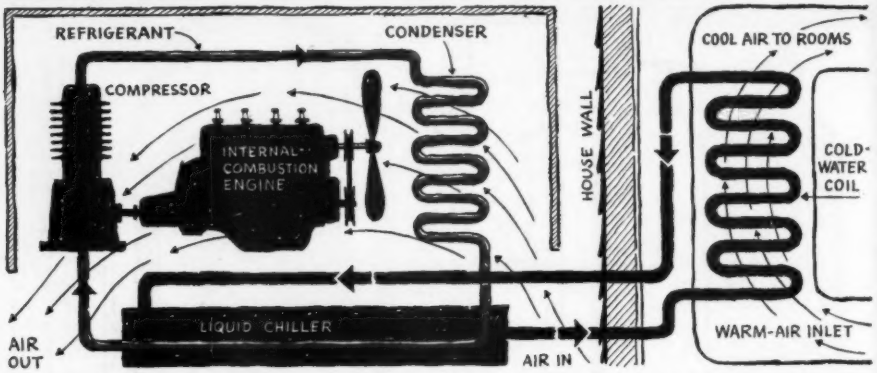
The hot-air-powered car could burn almost any fuel, and it would need no gearbox. Yet it would start as quickly as a gasoline engine, without prolonged warmup.

By using the engine as an air compressor, a direct mechanical connection to the wheels could even be eliminated. Compressed air would be delivered through tubing to individual reversible compressed-air motors at each wheel, which could be used also as brakes.

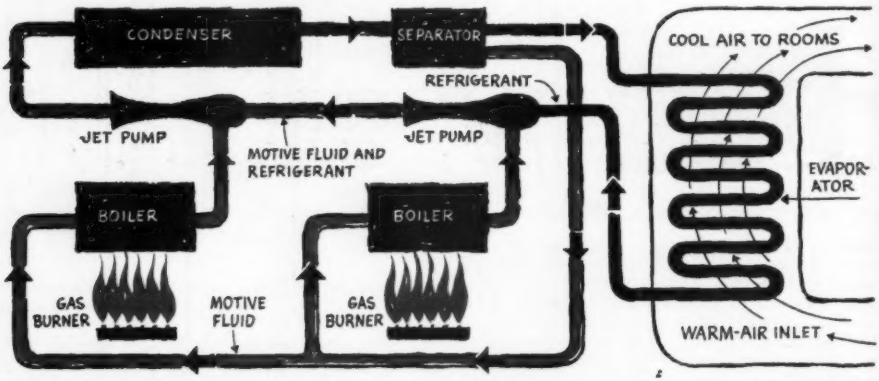
Curiously, the hot-air-powered car would automatically have a built-in air conditioner. The compressed air from the engine would expand as it turned an air motor. In expanding, its temperature would drop. The cool expanded air could chill the car.

Not enough cooling can be obtained in this way to air-condition a house, however. The hot-air engine, when used for home cooling, will be simply a power-

Cooling with gas: Four other ways to turn heat into cold



INTERNAL-COMBUSTION ENGINE—burning gas instead of gasoline—has already proved to be an economical source of power for air conditioning and is finding increasing use in some parts of country. It simply replaces electric motor to turn standard refrigeration compressor.



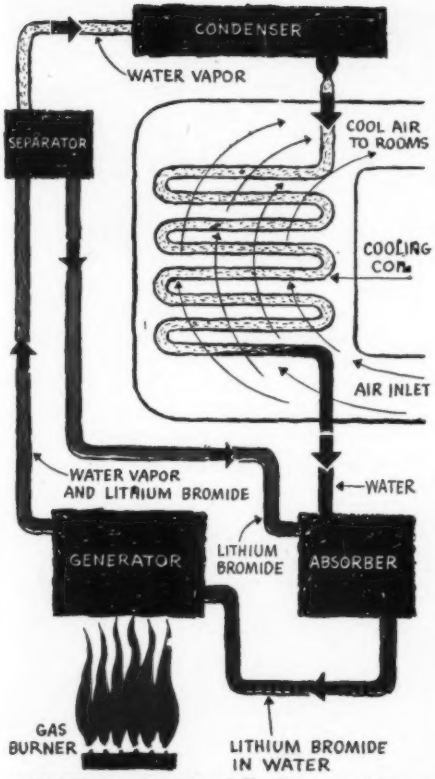
BINARY JET, using one fluid to drive another, is expected to be 55 to 60 percent efficient in new versions. Differences in density and heat absorption between two fluids make it work. A quicker-expanding fluid, heated to gas form, pushes around a more heat-absorbing fluid. The two are then separated, the heat-absorber to pick up room heat, the expander to be reheated so that it can kick off the cycle again. Equipment could be small and inexpensive enough for room-size cooler (other gas-powered units are meant to cool whole houses).

producing device. It will operate conventional refrigerating machinery.

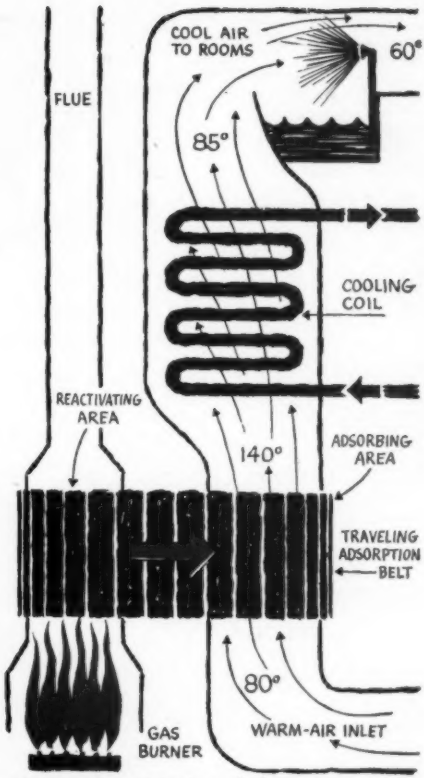
The hot-air car never got further than the patent papers because the Coleman Co. became interested in the engine. Coleman, a big manufacturer of gas furnaces, is now underwriting a large-scale study of several ways to use gas for summer cooling. The hot-air engine seemed like an unusual means to the goal.

How does it work? A typical old hot-air engine had two cylinders and two pistons. One cylinder was heated at one end and cooled at the other end. The heat expanded air, which was sent to the second, power-producing, cylinder to drive its piston. As the power piston moved, it caused a loose-fitting piston in the first cylinder to transfer the expanded hot air to the cold end of the cylinder, where it cooled and contracted. Then the transfer piston sent the air back to the hot end to expand and start another power cycle.

Engines built along these lines were quite widely used about 100 years ago for pumping water and other light jobs. But they were soon pushed into history



ABSORPTION SYSTEM chills by vaporizing a liquid refrigerant (water) in a vacuum. Refrigerant vapor is absorbed by another liquid, boiled off by the gas flame and condensed by a separate cooling coil. It is then ready to be vaporized again to continue chilling cycle. Simplified sketch above shows scheme used by Servel in latest model of home air conditioners it has been making for past 10 years.



ADSORPTION COOLER works by making air very dry and hot, cooling it somewhat with cold-water coil, then further chilling and rehumidifying it with water spray. Gas flame removes adsorbed water from drying material on traveling belt. The gas-cooling schemes shown here are only a few of the methods that are technically feasible. Several more are being studied by equipment makers and American Gas Assn.

by newer, internal-combustion engines.

Only a few years ago the Philips Co.—the big Dutch electrical concern—resurrected the hot-air idea and designed one (PSM, Feb. '48, p. 145) to power small electric generators for remote areas.

The trouble with older hot-air engines was partly the materials from which they were built, but mainly the fact that they operated at atmospheric pressure. A hot-air engine, like a steam engine, gains in efficiency with increases in pressure.

Professor Carnahan started from these engineering fundamentals and built a modern, high-pressure—and efficient—engine. His first working model has been quietly chuffing away in his shop for months—night and day.

It has a single cylinder about a foot high, with a cone-shaped top. Inside is one matching piston that does not fit quite tightly—air can pass around it as it moves. A gas burner sits on top of the cylinder; a water jacket cools the bottom.

The flame heats air in the top of the cylinder, causing it to expand and push

[*Continued on page 244*]

What's New in Foreign Cars

A NEW swarm of foreign cars, the biggest in history, is crossing the Atlantic these humid summer days to delight the eye of the guy who wants to hit the open road in something that's really different.

You want elegance and never mind the price?

Or something handy at under $1,000?

A custom job with a disappearing *hard* roof?

A breath-taking Italian body on a Detroit chassis?

A tidy British version of a two-door hardtop?

German economy—60 miles on a gallon of gas?

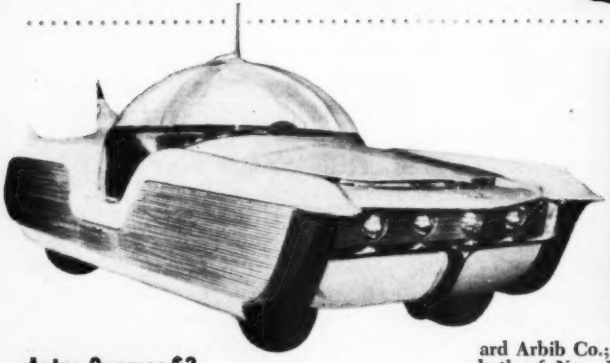
A Swedish mechanical smörgåsbord?

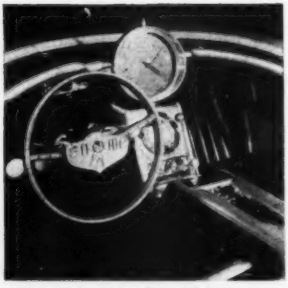
Or a vehicle as French as onion soup?

On these pages is a gallery of all those and several other new European imports.—*Devon Francis.*

Rolls Royce: $21,397

To keep the Rolls Royce looking the same, yesterday, today and forever, the factory has mounted up-to-date sealed-beam units inside those magnificent old headlight shells. All the prices given for the cars shown on these four pages are retail in New York except for the Dual-Ghia (p. 114), which is F.O.B. Detroit.





Astra-Gnome: $?

Strictly an exercise in styling, the Astra-Gnome is foreign only in that it looks like something from another planet. The designer is the Richard Arbib Co.; the builder, Andrew Mazzara—both of New York. It has a walk-in entrance, retractable running boards, interchangeable colored aluminum trim panels and a centralized dash with a "celestial time-zone clock permitting actual flight-type navigation."

Gaylord: $17,500

Combine a sports-car enthusiast with an engineer and a vice-president of a metal fabricating company, and you get James Gaylord of Chicago. Get Gaylord, and see what happens? Annoyed with numerous sports cars he has owned, he decided to design his own. This is it. Chassis, running gear, body and other components are manufactured in Ravensburg, Germany. With supercharging, the engine—from a Cadillac Eldorado—serves up better than 400 horsepower. The hard top retracts into the trunk (upper right) at the push of a button.

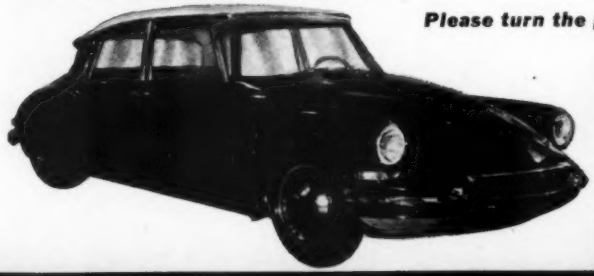
Saab: $1,795

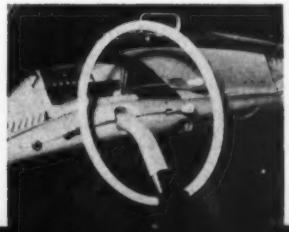
Pronounced "sob," this little chunk of Swedish energy is notable on two counts—it has a *three*-cylinder, two-stroke engine, and the power is on the front wheels. Radiator and fan are behind the engine which, producing 38 horsepower, is fed a diet of mixed gas and oil like an outboard. The wheels are individually suspended. If you want to take a nap, just tip the front seat backward and you're all set.

Citroen: $3,285

This French import combines a lot of features that most American manufacturers only talk about. Samples: independent air-oil suspension all around in place of springs; fade-proof disk brakes (in front, drums in the rear); front-wheel drive (like the Saab); and a central hydraulic system for the brakes, suspension, automatic transmission (no clutch, but you still shift) and power steering. The 75-horsepower engine is good for an honest 87 miles an hour. And how about that one-spoke steering wheel?

Please turn the page for more foreign cars





BMW Isetta Kleinwagen: $998

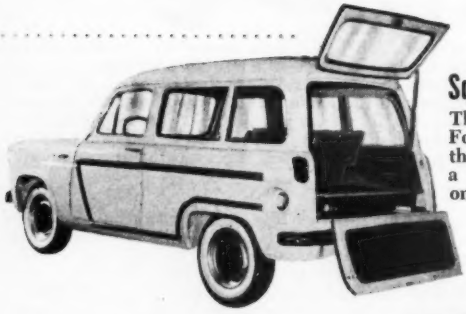
All this, and 60 miles to the gallon, too? A one-cylinder, four-cycle engine with 13 hp. drives the Kleinwagen at—no fooling!—53 miles an hour with two people aboard. The steering column, anchored to the door, is hinged.

Ferrari: $15,000

The price covers a body built just for you by Farina.

Dual-Ghia: $7,646

There's a Dodge hidden here. The Ghia results from shipping a D-500 engine and chassis to Turino, Italy, for a special body job. In the conversion process, the chassis is welded to the body and the engine is set back 11 inches to give the car a better dynamic balance.



Squire: $1,695

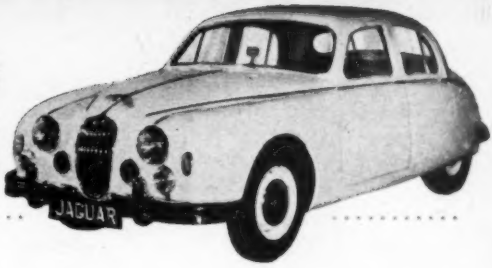
The poor man's station wagon, this British-built Ford has 41½ cubic feet of cargo space, less than half that of its U.S.-made counterpart. But a modest 36 horsepower and total weight of only 1,870 pounds mean fuel economy.

Arnolt-Bristol: $6,395

Wanna race? That's what the Arnolt-Bristol is really built for. It's a good over-the-road car, too. Manually controlled headlights, retracted here, pop out for night driving. Horsepower: 130.

Jaguar Two-Point-Four: $3,795

This British Jag is spanking new, with a smaller (146-cubic-inch) engine than the XK-140 or Mark VII. It gets 30 miles to the gallon at 45 miles an hour, yet can reach 100 miles an hour toting five passengers.

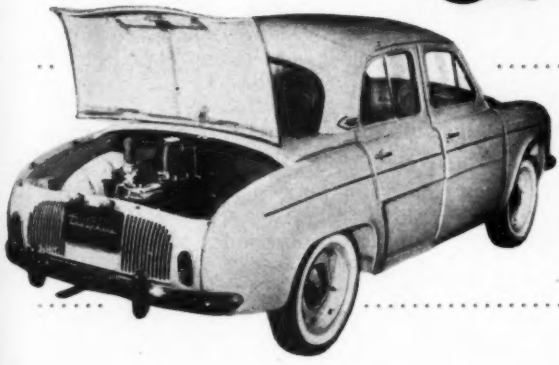


BMW-507: $7,800

Germany's road-hugging V-8 is one of the world's hottest cars, with the most imaginative engineering since the introduction of the Mercedes 300-SL. As is, it will do 160 miles an hour; tuned up it may go as fast as 180. That's in fifth gear. A lot of people will tell you that it's the prettiest of all the imports, too.

Sunbeam Rapier: $2,499

Here we have a handsome British version of a two-door hardtop. The seats—naturally—are upholstered in that unmatchable British leather. Horsepower: 62. Top speed: 90.

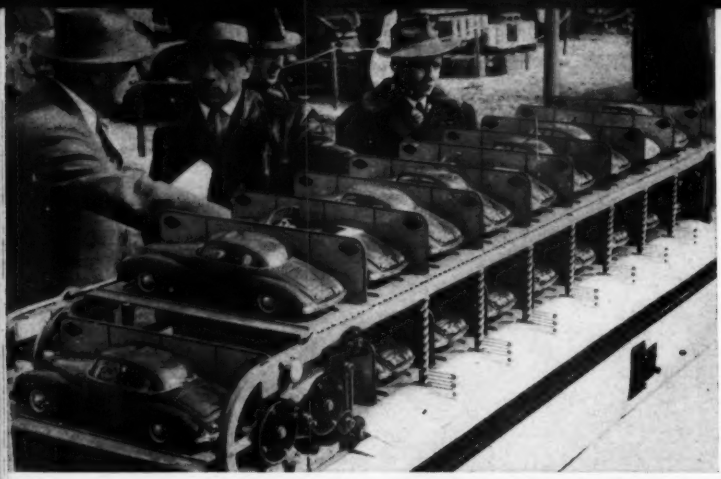


Dauphine: $1,595

France's Dauphine, by Renault, has four independently sprung wheels and a sassy four-cylinder, 30-horsepower rear engine that can get it up to 70 miles an hour. At 40, says the sales literature, it meters 42 miles per gallon. It weighs 1,390 pounds.

Volvo: $4,000

The sports job shown at right ought to carry a "Not For Sale" sign. As yet, it's not available in the U.S., but it may be soon. Sweden's conventional Volvo sedan, which *is* available, retails in this country for $1,995. END



Germans Propose Endless-Belt Parking

ASSEMBLY-LINE parking was demonstrated by this garage model shown at the recent German construction machines exhibition in Munich. It uses a motorized endless-belt floor to move individual parking pens from the ground level to an upper-story car-storage area.

Lights Shaped for the Color-Blind

A MOTORIST who can't tell red from green would get the "go-ahead" from these shaped signals suggested by Sandy Pearlman, a 12-year-old New York City schoolboy. A vertical bar would mean red, a cross amber, the triangle green.

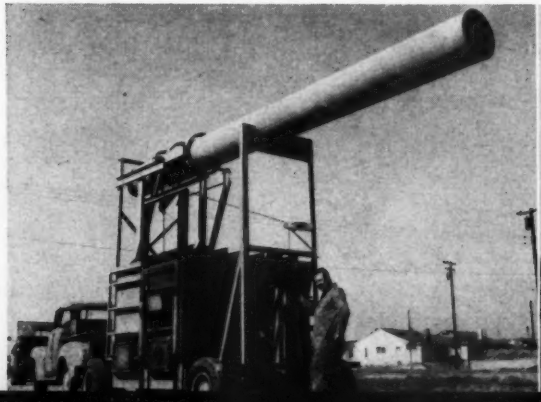
Lighted Glove Signals Turns

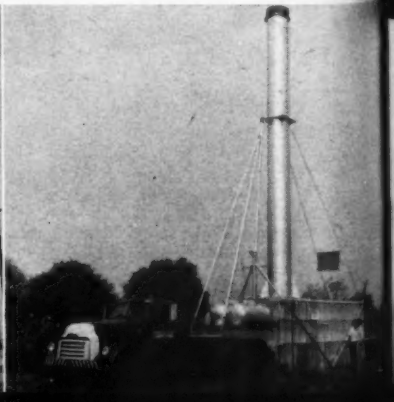
MOTORCYCLE traffic, which is heavy in Britain, is now also safer. This rider is signaling a turn with a leather glove which has a red light imbedded in its back. A contact between thumb and forefinger switches on a small battery.

▸▸▸ It's a smaller world, by half a mile, according to new measurements made by Army Map Service scientists. The revised girth figure—24,889.27 miles—for our planet may be important in tracking man-made satellites.

Big Mobile "Gun" Burns Up Rubbish Without Making Any Smog

THEY'RE not smug about smog in southern California; they fight it. Latest weapon, used in clearing away orange groves for housing developments, is a portable incinerator. A 32-foot stack lowers into horizontal position for travel, raises to provide smokeless exhaust for burning 1,000 pounds of waste an hour.





Snorkel Solos To Test Planes' Anti-Sub Radar

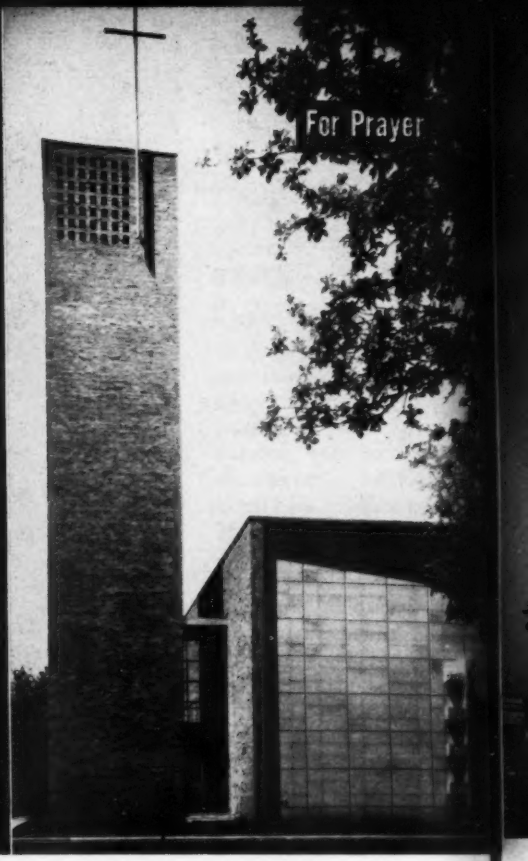
AIRPLANES trying out new electronic submarine-hunting gear must have a snorkel to spot. The Navy, not wanting to tie up an actual sub and its crew, came up with this simulator. It's a real snorkel (above-surface breathing device) from a World War II German U-boat. Powering it is a small torpedo-like hull containing a 90-hp. diesel engine. The man riding the offset bicycle-type seat steers the rig into evasive maneuvers to give airborne radar operators a realistic workout on their scopes.

Freight Car Cushions Cattle

BEEF on the hoof is riding in luxury on the Union Pacific Railroad. New, all-steel stock cars have slats that are cushioned on the inside with a rubberized material (similar to the undercoating of your car) that is a nonconductor of heat, cold and electricity. The insulation, ¼-inch thick, is sprayed on.

Blacksmith Shop Rolls to Work

VILLAGE blacksmiths in England have to look afar for horses to shoe. That is why Bill Groom, of Slough, near London, mounted his smithy shop, forge and all, in the sidecar of a motorcycle. In the photo above, Bill, summoned to a farm by telephone, trims a hoof for a shoe that will fit a one-horsepower job.



New Architecture Refashions Towers for Beauty and

AT STUTTGART, Germany, observation galleries and an air-conditioned restaurant are built into a radio transmission tower. Spiral stairs connect four levels.

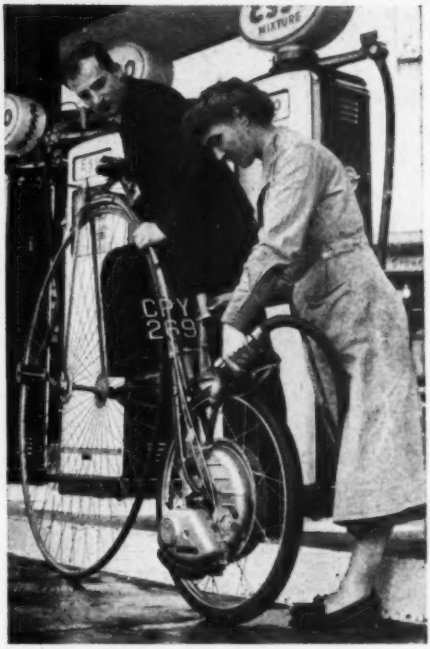
In Minneapolis, a Lutheran Church cited for its architectural excellence eliminates the old roof-top spire and stows its bell in a semi-detached tower.

Supersonic Tow Target is Snatched Up Like a Glider

TWELVE feet of steel tubing fitted with four tail fins makes a new faster-than-sound target for bullets, rockets and guided missiles. Called the Dart, it is designed to take the rough punishment it gets when pulled through dives, turns and other evasive maneuvers by a supersonic tow plane. In the three views at right, the target is shown on the ground, ready for a "snatch-launch"; being "snatched" by a low-flying Sabrejet; and in towed flight at the end of a nylon line. Beech Aircraft developed it.

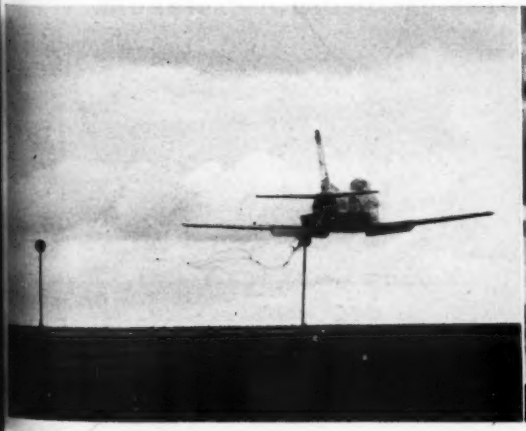
Utility in World of Today

Out Hollywood way, a building as round as the phonograph disks made by its owners cuts down travel time from office to office on 5,400-square-foot floors.

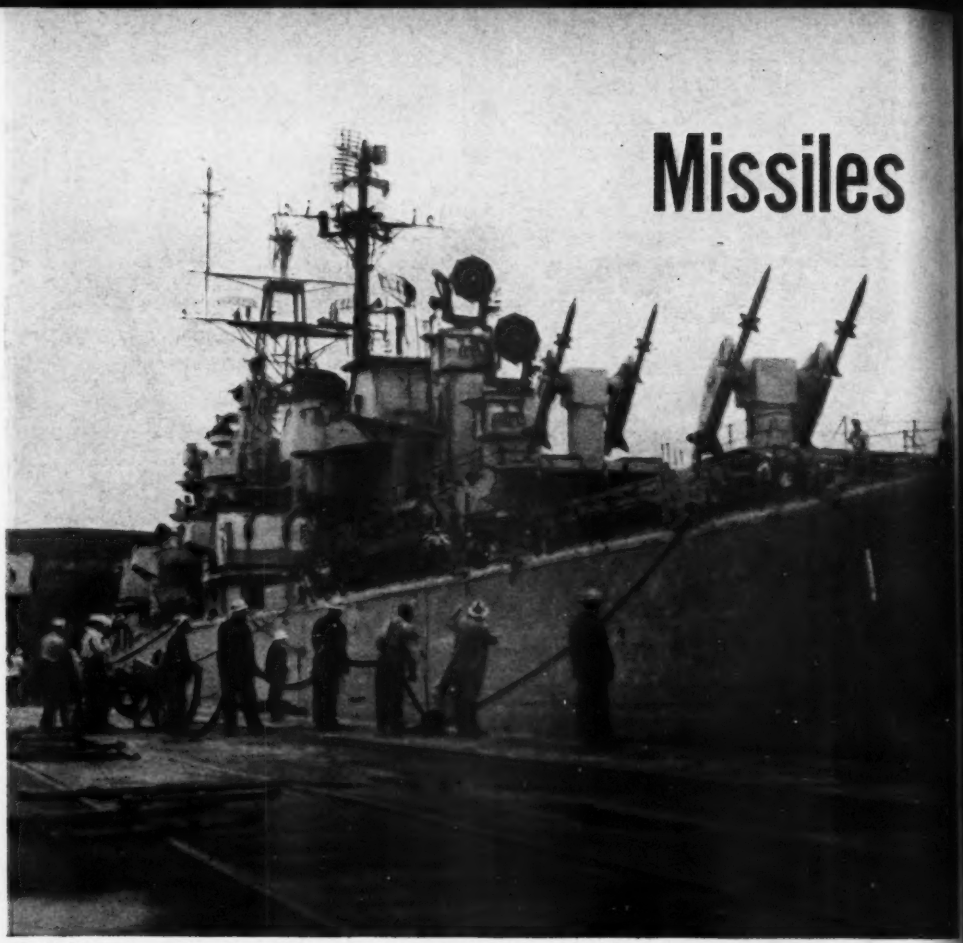


High-Wheeler Goes Modern

THIS "Penny Farthing" bike taking on petrol here is one of a collection of ancient cars and bicycles owned by Rowland Winn, a garage operator of Leeds, England. Now motorized for tooling over 20th-century roads, it probably won't top racers of its era. Such high-wheelers of the Eighties could transport an energetic pedaler at 20 m.p.h.

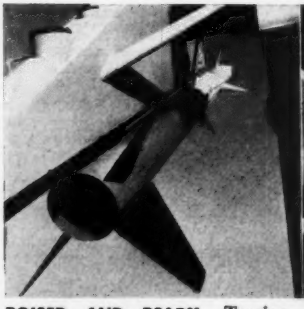


Missiles



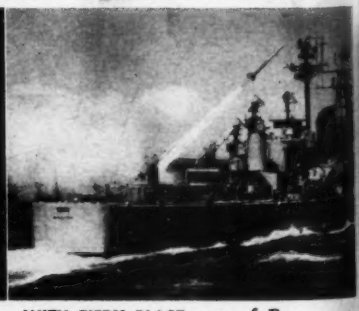
Guided-missile cruiser Boston fires Terrier missiles from launchers that replace guns aft . . .

This is how a guided-missile cruiser goes into action against an attack



POISED AND READY, Terrier missile is trained on target by moving launcher. This view is from beneath missile's rear or booster end, looking skyward.

PRESSING TRIGGER like this one lets missile fly. Radar beam and launcher are locked on the target, and missiles are fired by remote control from below deck.



WITH FIERY BLAST, one of *Boston's* Terrier missiles streaks aloft. At supersonic speed it rides radar beam that guides it on collision course to target.

Replace the Navy's Big Guns

Deadly new weapons that make their kill miles beyond range of biggest guns are revolutionizing naval design and tactics.

By Alden P. Armagnac

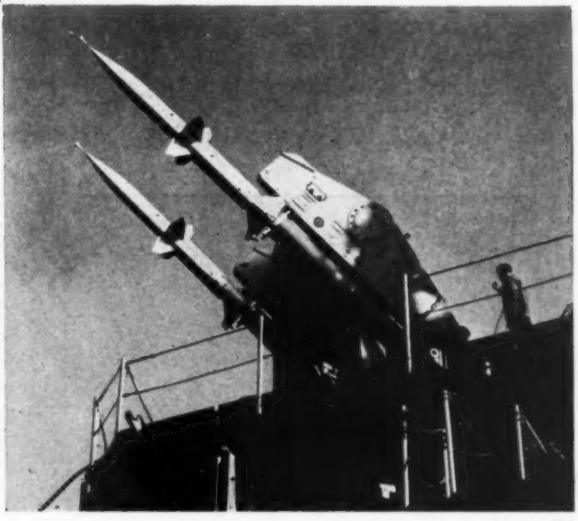
THE United States, world's greatest sea power, is building a guided-missile Navy. Missile launchers, instead of gun turrets, arm our latest fighting ships. Britain is following our lead, as other navies doubtless will.

Big guns, the final arbiters at Jutland, at Surigao Strait and in other classical sea battles of the past, may have thundered for the last time in a great naval engagement. Their arching shellfire may well be superseded by rocket- and jet-propelled missiles, steered to targets by radar.

Only yesterday, massively armored "ships of the line" steamed into battle in majestic procession. Today there is no battle line. Dispersed miles apart by the threat of nuclear weapons, carriers and cruisers of fast task forces will hurl missiles at targets far beyond gun range.

What the Navy calls its first combatant missile and herald a new naval era.

LAUNCHER automatically turns, and tilts its arms, to aim these two Terrier antiaircraft missiles at the flying target.



by enemy airplanes.

MAKING THE KILL, Terrier has exploded near a pilotless target plane and brought it down, in flaming fragments of wreckage seen in this long-range photo.

PRINCIPLE of "beam-rider" guidance system applied by Terrier missile is shown here. Ship's antenna, following target, projects radar beam upon it. Launcher fires missile into beam, which steers it to target. This "local" system serves primarily for defense; longer-range missiles, for attack.

ship, the guided-missile cruiser *Boston,* joined the Atlantic Fleet early this year. Formerly a conventional 13,600-ton heavy cruiser with three gun turrets, it has been radically remodeled. Two missile launchers have replaced its after gun turret. The two forward turrets, each with three eight-inch guns, remain. A sister ship, the *Canberra,* is undergoing conversion to the same hybrid armament. These cruisers, and some of the guided-missile ships of various types on the way, fire the rocket-propelled Terrier "surface-to-air," or antiaircraft, missile.

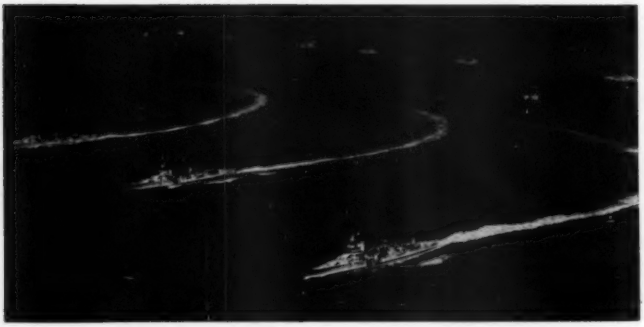
Other U. S. warships, meanwhile, have been adapted to launch the Regulus surface-to-surface missile. This has required so little alteration that the vessels have not even been formally redesignated as "missile ships." Essentially a pilotless jet plane, the Regulus has been designed for use against shore targets and surface craft.

Now the Navy's 1957 construction program reveals bold new designs. An all-missile cruiser will be the first surface ship propelled by atomic power. It will have unlimited range, and will cruise at a sustained high speed that would rapidly use up conventional fuel. An atomic-propelled, missile-firing submarine scheduled in the same program foreshadows our future undersea craft.

Now any warship can deliver

FROM A CARRIER, a steam catapult launches the Regulus. An expendable wheeled carriage falls away as the missile leaves the deck, above.

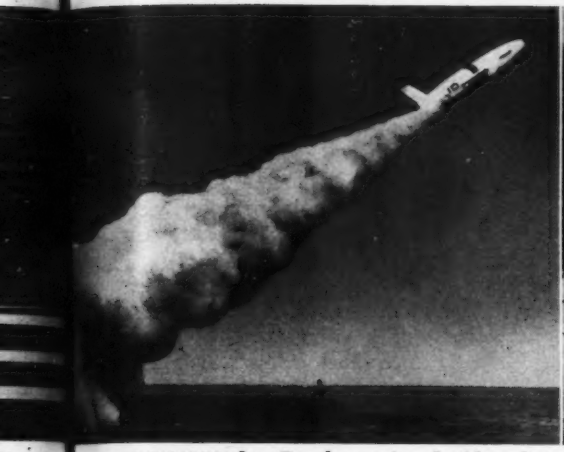
The Navy is farther along with guided missiles than most people realize. For shipboard use it now has four kinds of missiles: the Terrier and Regulus, already in quantity production, and the still newer Talos and Tartar. To fire them, missile ships of many types are built and building: submarines, de-



The Past

Cruisers (foreground) and battleships maneuver in '39—virtually pre-enacting U. S. battle formation of '44 that destroyed a Jap fleet at Surigao Strait, Philippines, in what may have been history's last big-gun fleet action. Atomic era puts an end to such close formations.

a heavyweight punch with surface-to-surface Regulus missile



SUBMARINE fires Regulus equipped with rocket booster, to start it on way. Undersea craft offshore could thus bombard enemy homeland.

CRUISER launches rocket-assisted Regulus from "zero-length" launcher near stern. Installing it on ship involves only minor alteration.

stroyers, frigates, light and heavy cruisers, and aircraft carriers. And these are but prototypes for many more to come.

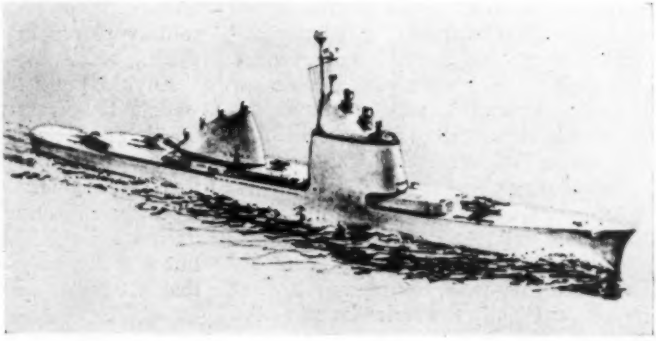
This country has an unusual opportunity to acquire so ultramodern a fleet, without the costly waste of scrapping "under-age" but outmoded vessels. Huge numbers of U. S. warships mass-produced during World War II will soon become "over-age" and due for replacement—first submarines, then destroyers, then cruisers and carriers. (By world naval standards these categories have useful lives of 13, 16 and 20 years respectively.) Underscoring the need to replace them is the challenge of Russia's navy, already the world's second largest and rapidly growing. A big building program, normally coming up, will thus give the U. S. a sizable fleet of brand-new warships. Our naval planners are pushing development of designs to make them the last word.

A visitor to the guided-missile cruiser *Boston* sees the pioneering example of the new Navy. Needle-nosed Terrier missiles, pointed skyward in their launchers, give this ship a silhouette new to naval observers. On towers that rise just forward of the missiles are the bowl-shaped radar antennas that guide them in flight.

Aboard the Boston, a close-hand view of the blue-and-gold missiles reveals their formidable size. A Terrier has the

The Future

Navy's sketch of atom-powered "all-missile" cruiser, scheduled for construction, visualizes warship of tomorrow. Supplanting "ships of the line," vessels like this will course the seas miles apart in dispersed formations, as fast, far-ranging task forces.



girth of a big naval shell and stands twice as tall as a man. A rocket "booster" starts the missile on its way, and then drops off. Hidden within the missile itself are a "sustainer" rocket for propulsion; guidance mechanism for steering; and the explosive warhead, with a fuse that detonates it when the missile comes within effective range of the target.

With boosters attached, Terriers hang in pairs on recently developed missile launchers—something new in naval armament. A launcher's central column revolves like a turret, and twin arms pivot on a massive crossbar, to aim the missiles in any direction. Launchers are operated, and Terriers fired, by remote control from below deck.

A finger's touch on a firing trigger sends a Terrier screaming aloft. To reload an emptied launcher, its twin arms tilt to vertical position. Through opened deck hatches, missiles are elevated from a magazine directly below by loading mechanisms nicknamed "coke machines." The rising missiles engage guide rails on the launching arms. Then the arms swing back into firing position

NEW TERMS like "chief missile officer" (insignia shown above) are remaking naval language.

It's no secret that the supersonic Terrier uses a "beam-rider" guidance system, developed by the Applied Physics Laboratory of Johns Hopkins University. In principle it works like this:

Broad "search" radar of great range gives the first warning of enemy aircraft. Air patrols speed to intercept them. But suppose a hostile plane somehow eludes interception, and continues approaching. At a certain point in its flight it becomes "of interest" to the *Boston's* missile battery.

Automatic devices begin tracking it. Indicators tell its speed and altitude. Evaluating the data, the missileers decide what they want to fire, and in what sequence. Finally the radar beam of the missile-aiming director is swung to the target and locked on it. From then on, the turretlike missile launcher automatically turns and tilts its arms to follow the hostile plane's course, and missiles may be fired at will.

A Terrier is launched into the radar beam. At more than twice the speed of sound, it rides the beam on a collision course to the target. It has been reported effective against planes at altitudes up to more than 60,000 feet.

The *Boston's* missile battery, its officers confidently hold, surrounds the ship with a zone of invulnerability to air attack. The radius of this circular zone equals the Terrier's range, which is the Navy's secret. Judging from a Johns Hopkins scientist's published calculations for a hypothetical but similar missile, it may be nearly 20 miles. If so, one guided-missile cruiser of the *Boston* class will shield an area of some 1,000 square miles from hostile aircraft.

Standing offshore in support of an amphibious landing, it could extend a protective "umbrella" while a beachhead was established. One or more guided-missile cruisers accompanying other ships of a task force could provide an antiaircraft screen for all.

A high-explosive warhead, with which the Terrier can be fitted, gives it a punch far more powerful than that of any antiaircraft shell—and ample to deal with solitary planes or with small groups of them.

Envisioning a future naval task force, Assistant Secretary for Air James H. Smith Jr. recently predicted, "Nuclear warheads would be available for missiles fired against large bomber formations." Does the *Boston* have atomic Terriers in its magazines? The Navy isn't saying—but it seems only reasonable to suppose that a combat ship would be prepared

[Continued on page 240]

New Ideas from the Inventors

1 Windowed Float to Show Sea Life. You could view the color and action of underwater scenes comfortably and easily from these inflated rubber mattresses. Extending below the surface, a tubular, glass-bottomed opening in the pillow portion would let you look down at a ripple-free expanse of water.

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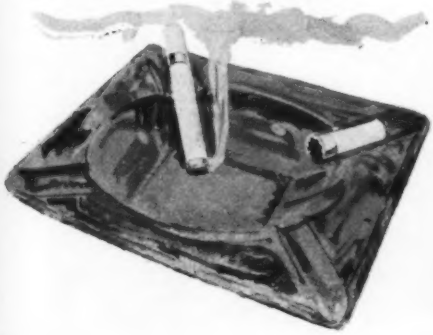
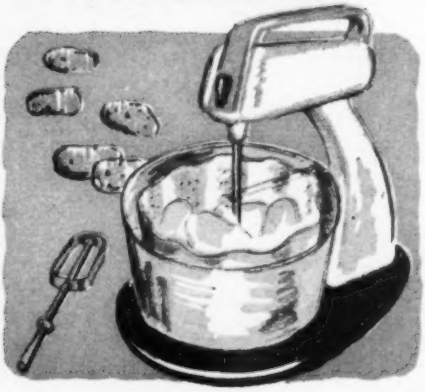
2 Cigarette to Snuff Itself. A cigarette banded with metallic foil, says this inventor, would unfailingly extinguish itself if it were dropped or tossed away. By stealing heat rapidly from the burning tip and dissipating it, the metal would quickly kill the embers.



3 Magnet to Steady Screws. A magnetic collar that would slip onto a screwdriver would grip steel or iron screws so they could be started in hard-to-reach spots. One collar would fit several screwdrivers and it would hold itself on the shaft magnetically.

Please turn the page for more new ideas

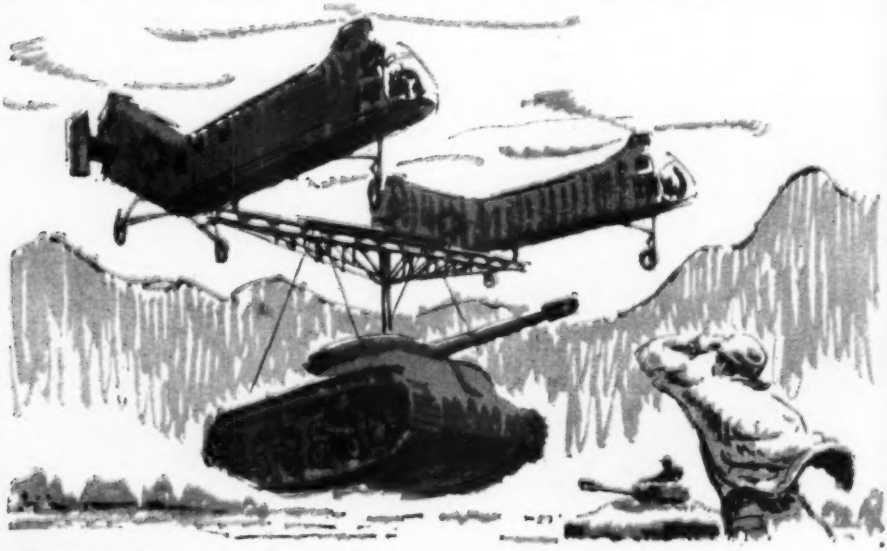
More New Ideas from the Inventors



4 Mixer to Peel Potatoes. With this spindle-and-bowl-attachment, your kitchen mixer might take over the dreary chore of peeling potatoes. Rotation of the bowl and spindle would tumble the vegetables around, and an abrasive bowl liner would scrape off their skins.

5 Wiper to Soap Off Grime. Aided by a detergent in this wiper, the first few raindrops would clean a windshield instead of smearing dust and oil film over the glass. The rocking action of the blade would release the detergent from a cartridge which could be replaced.

7 Copter Harness to Increase Lift. For freight-hopping jobs beyond the capacity of a single helicopter, this Navy-assigned patent would use a crane-like truss to team up two or more of the whirlybirds. The steering apparatus of the harnessed copters would be brought under the control of one pilot.



6 Oar to Double as Hook. This hook-ended paddle might prove handy if you cut your motor too soon and had to row up to the dock. You could use the all-purpose pole to propel your boat, pick up a line, shove off, or hold your boat clear of the dock or another craft.

8 Hanger Grip to Spare Clothes. You wouldn't be likely to crush the collar of your coat—or lift any garment by the nape of the neck—if its hanger had an outboard pistol grip like this. The convenient side grip would also make it easier to hang articles of clothing or withdraw them from a closet.

9 Chair to Stretch for Company. The telescoping frame of this space-saving sofa would squeeze down to chair size for everyday use (in background). When extra seats were needed, however, the frame could be pulled out to double size. The foam-rubber back of the chair would be a cushion for the extra seat.

U. S. patents *on these inventions have been granted to: 1. H. T. Backhouse, Fort Charlotte Heights, Nassau, Bahamas; 2. W. H. Claussen, Seattle, Wash.; 3. W. V. Doyle, Chicago; 4. H. T. Lamb, Newcastle upon Tyne, England; 5. J. R. Oishei, Buffalo, N. Y.; 6. P. D. Ake, Northfield, N. J.; 7. R. A. Young, Fairfax, Va.; 8. R. M. Snook, San Francisco; 9. J. W. Leary and F. E. Mangialomini, Bloomfield, N. J.*

The Joe Who Commands an Army of Scientists

Here's the man in charge of U.S. plans for the Geophysical Year. Marshaling his forces keeps him moving like an earth satellite.

DR. JOSEPH KAPLAN, chairman of the U. S. National Committee for the International Geophysical Year, gazes into a transparent globe of the universe.

By Wesley S. Griswold

NEXT year, when science launches the greatest study that has ever been made of the world we live in, the American forces will be directed by a Rotarian, sports fan and limerick writer named Joe.

He is Dr. Joseph Kaplan, a physicist on the faculty of the University of California at Los Angeles. He is the chairman of the U. S. National Committee for the International Geophysical Year.

So many things will be done in so many places during that "year" that it will actually take a year and a half to complete them. Scientists in more than 40 countries will all be making—at the same instant—measurements of the sun's behavior, ocean currents and tides, glaciers, earthquakes, latitude and longitude, the earth's magnetic field, gravity, cosmic rays, the ionosphere, the aurora and the weather.

Sending artificial satellites into the heavens (PSM, Jan. '56, p. 124) will be the most spectacular part of the American scientists' activities, but only a small part of the colossal program. Dr. Kaplan's task forces and their allies will simultaneously tackle such questions as:

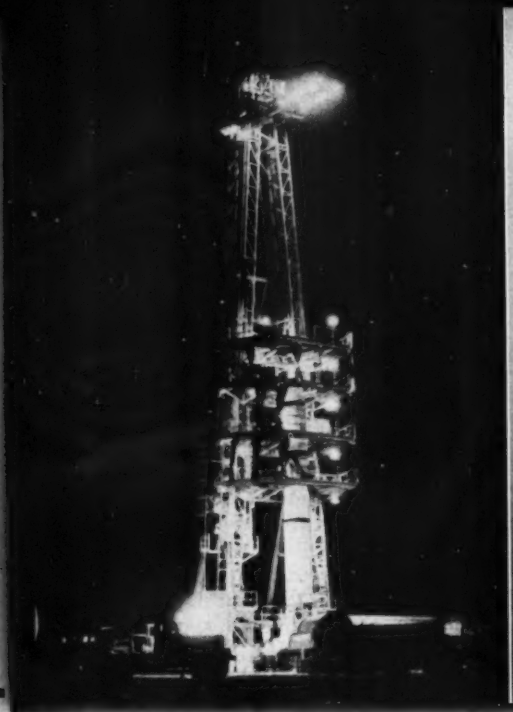
Are the continents drifting? If so, how much?

What is the exact shape of the earth?

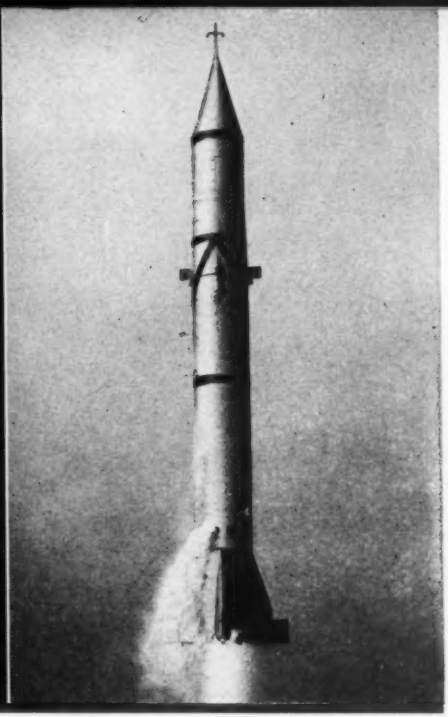
How can we improve long-range weather forecasting?

What is the precise location of any spot on earth? (We know that even the best maps are still wrong about a lot of places.)

The particular span of the International Geophysical Year, from July 1, 1957, to Dec. 31, 1958, was selected because it coincides with a period of maximum sunspot activity, when scientists are likely to learn most about how these extra bursts of solar energy affect our lives. It will last six months longer than a normal year in order to allow time for expeditions to get into and out of the Arctic



ROCKET SERVICE STATION fuels a missile for firing from Patrick Air Force Base, Fla., where earth satellites will be launched. Structure automatically rolls away if anything goes wrong.



REDSTONE MISSILE, developed by the Army, thunders into the stratosphere from Patrick base. To push the satellites into their orbits will require a more complex, three-stage rocket.

and Antarctic and make the same seasonal observations in both areas.

During the IGY, there will be several Regular World Days each month. On those days, all of the geophysical stations on earth will make exactly specified observations with the same sort of instruments, in the same manner and at the same time. For example: As part of the study of auroras, it is planned to have 180-degree cameras all over the world take photographs of the sky at one-minute intervals on the nights of all Regular World Days.

On other days, more than 100 stations around the earth will take vertical soundings of the ionosphere with radio beams every 15 minutes.

Weather balloons of many nations will simultaneously take soundings up to an altitude of 100,000 feet, on regular schedules, along three widely separate lines stretching from pole to pole.

The sun will be under continuous observation, by automatic cameras and a great battery of other instruments. When unexpected activity takes place on the sun's surface, an alert will be radioed to all observers. Scientists will then mobilize for concentrating and coordinating their investigations on a Special World Day, named in the alert.

For 10 days after the beginning of each new season, there will be World Meteorological Intervals. During these periods, observers everywhere will concentrate intensely on studying the meteorological effects of seasonal change.

An international fleet of ships, including eight American and a dozen Russian vessels, will sail the oceans, mapping and clocking the pace of the currents, measuring sea levels, probing the depths. Submarines will seek gravity measurements where none have been obtained before.

Hundreds of research rockets will be launched by the U. S., Australia, France, Japan and Russia. They will soar from the ground, from balloons and from air-

FOR UPPER-AIR STUDY during the Geophysical Year plastic balloons, like this one used by the Air Force, will carry meteorological instruments above the range of manned airplanes.

IN FROZEN WASTELANDS scientists will probe weather secrets of Arctic and Antarctic. Above: an Army engineer in Greenland examines tunnel connecting experimental subsurface buildings.

How Three-Stage Rockets

planes to investigate cosmic radiation, high-altitude winds, ionospheric currents, atmospheric pressures, fluctuations in earth magnetism, and other matters, up to 200 miles above the Arctic and Antarctic, as well as above temperate and tropical regions.

An American radar station in Alaska and an Australian radar outpost on an island not far from Antarctica will synchronize their observations of auroras at both ends of a magnetic-field line. The Italians hope also to create *artificial* auroras, with beams of radio waves.

Eleven nations will converge on the Antarctic continent, to set up more than 30 observation posts and explore that 6,000,000-square-mile land of mystery.

The U.S. program, quite apart from its earth-satellite climax, will include activities at more than 100 stations in the Arctic, Antarctic, continental U. S., Central and South America, adjacent parts of the Atlantic and Pacific Oceans, and the Equatorial Pacific.

Big-framed, tall, humorous Dr. Joseph Kaplan, 53, who must coordinate all this activity, is already one of the busiest scientists in the nation. The tempo of his life should continue to rise as July 1, 1957, approaches.

"Joe was chosen for the chairman's job," said an official of the National Academy of Sciences, "because he has outstanding qualities of leadership, expert knowledge of the geophysical field and great ability to get along well with other scientists."

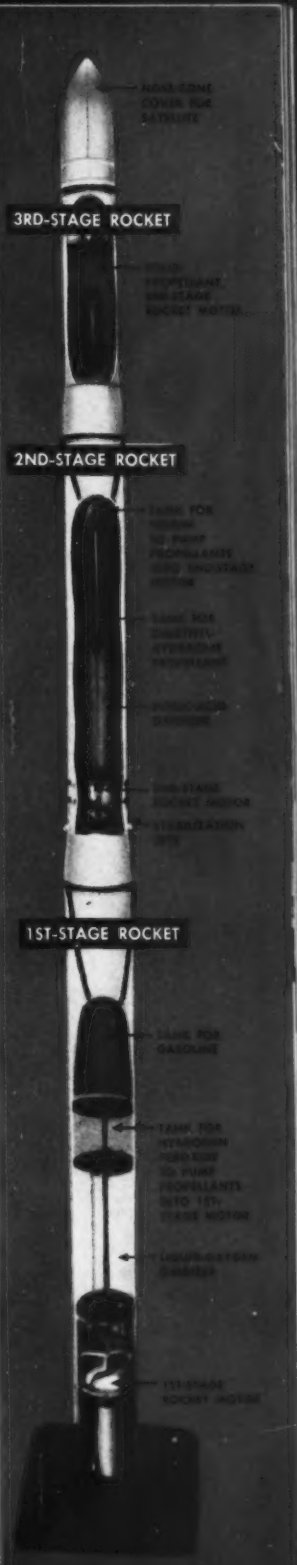
As top director of U. S. activities in the IGY, Dr. Kaplan is bound to take an interest in all aspects of the Year. Closest to his heart, though, are the plans for the meteorological program and for investigating auroras and airglow—his own, long-time professional specialty.

Airglow—the self-illumination of gases in the upper atmosphere—is a phenomenon closely related to the aurora.

When Dr. Kaplan was 26, and a Na-

[Continued on page 210]

Will Launch the Earth Satellites



COMPONENTS OF THREE-STAGE ROCKETS that will send the baby moons into their orbits are shown in this model.

DESIGN of the model was based on official information that has been released on the actual Vanguard missile.

TRIGGERING MECHANISM in nose of third-stage rocket is tripped by young lady below, showing how the man-made baby moons may be injected into their orbits. The rocket model was built by Dr. I. M. Levitt, director of the Fels Planetarium, Philadelphia.

America's Biggest Uranium Mine

New discoveries of huge U.S. deposits make A-ore plentiful.

A FABULOUS uranium mine in New Mexico will enrich this country with millions of tons of atomic ore. It has begun tapping a bonanza that is officially described by the U.S. Atomic Energy Commission as the largest-known uranium deposit in the nation.

In the Laguna Indian Reservation, about 60 miles west of Albuquerque, this vast ore body forms a flat-lying bed six to 20 feet thick and more than 100 feet below the surface. There's so much ore that it's worth while removing the whole overlying layer—deep enough to bury an eight-story building—to get at it.

A huge and growing man-made crater, the Anaconda Company's open-pit Jackpile Mine, has resulted. Measured either by sheer physical size or by ore reserves, it must be the nation's biggest uranium mine. Recently it reached the pay-dirt level and now the ore is coming out.

[*Continued on page 214*]

Huge open-pit Jackpile Mine turns New Mexico

FROM JACKPILE ORE, apparatus in Anaconda's mill at Bluewater, N.M., extracts the uranium for AEC as a yellow concentrate.

mesa into canyon, to tap largest-known U.S. uranium deposit. Ore is at lowest level in photo.

HERE'S SAMPLE of ore from Jackpile Mine. Yellow and black uranium minerals—mostly yellow carnotite, which spots and flecks this specimen—richly impregnate grayish sandstone.

IN AEC REFINERY, concentrate from uranium ore successively yields yellow, brown and ultramarine compounds shown in this Union Carbide photo, on way to becoming silvery uranium metal.

The author of an exciting new book refutes

False Ideas

By Clifford H. Pope

Author of *The Reptile World*, Alfred A. Knopf, New York

TINY SCARLET KING SNAKE is a nonpoisonous constrictor that swallows worms and small snakes. A mimic, it wins protection from a close resemblance to the deadly coral snake.

SPECKLED KING SNAKE (above) is a larger cousin of scarlet king. Extreme variation in color patterns of species is typical of the seven North American kings. This one lives in south-central U. S.

WATER MOCCASIN, also known as the cottonmouth, is often confused with harmless water snakes. Strictly a denizen of lowlands in the southeastern and southern United States, its bite is occasionally fatal to human beings.

GARTER SNAKE is the most abundant and widespread family in North America. This coastal garter is one of 11 U. S. species. Garters like water and city life.

About Snakes

PEOPLE have nourished a grudge against snakes ever since the Biblical serpent talked Eve into eating forbidden fruit. Possibly because of this they have uncritically believed a great many things about snakes that just aren't true.

Clifford H. Pope, in a highly readable book published recently, sets the facts straight. He formerly was curator of amphibians and reptiles at the Chicago Natural History Museum.

Here are his answers to some common questions about snakes. You'll find some of the answers surprising!

Q ***Do constrictors crush their victims to death?***

A No. A man or animal seized by a snake is thrown into a panic and struggles violently to escape. This makes his body call for a lot of oxygen. The snake merely takes advantage of its victim's heavy breathing by throwing several coils snugly around the chest. Each time the prey expels its breath, the renewed snugness of the coils prevents expansion. Suffocation is inevitable.

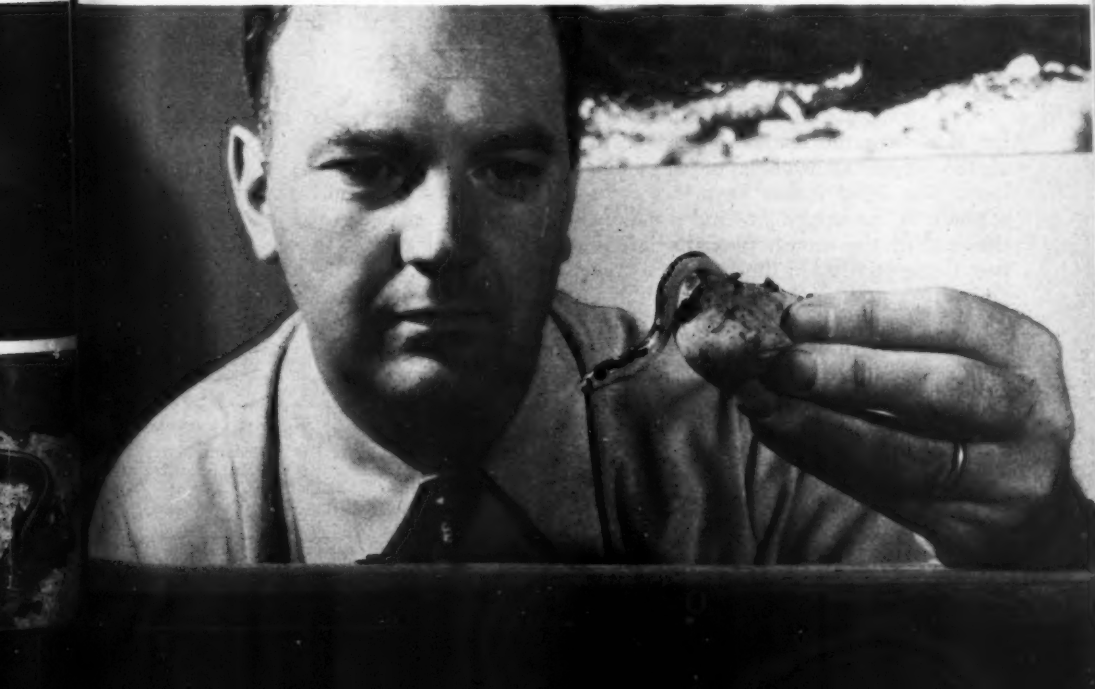
Q ***Do snakes hypnotize their prey by staring at them?***

A No, the stare of a snake is due to its lack of ability to close the eye—that is to cover it with a movable lid. The eye is permanently protected by a transparent cap continuous with the skin. It manages to sleep with eyes open.

Q ***Do snakes hibernate underground in winter, frozen solid?***

A A snake has no effective internal heat-producing mechanism as does a mammal or a bird, and therefore must

NEWBORN KING COBRA slithers out of egg after slitting it with his "egg teeth." The man is a herpetologist (snake expert) at New York's Bronx Zoo, which supplied these photos.



stay in relatively warm surroundings from which it can absorb the necessary heat—a few feet below ground is sufficient in winter. In southern Montana, instruments buried four feet in the ground beneath eight to 15 inches of snow did not register a temperature lower than 33.8° F., although the air temperature above the ground went down to minus 43° F.

Q ***Can you tell a rattler's age by the segments in its rattle?***

A The age of a snake does not equal the number of segments of the rattle because more than one segment is added each year (one at each shedding of the skin). Thus the number of segments in a *complete* rattle would be much greater than the age of the snake in years. Besides that, the terminal segments almost invariably are lost when the snake is only a few years old.

Q ***Can you tell from bite marks on a victim whether the snake is poisonous?***

A From general hearsay the victim might think that the bite of a venomous snake leaves only two punctures. The complicating factors here are two: Coral snakes and certain of their relatives, chew in biting. Also, the viper in spite of its long fangs, is apt to pierce the skin with the many ordinary teeth of the upper as well as those of the lower jaw. Most snakes have four rows of teeth in the upper jaw and a pair in the roof of the mouth plus the lateral pair lying just inside the lips. The true and pit vipers lack the lateral pair, which has been replaced by fangs. Where only two punctures are found, the indication is that the bite is dangerous, but the reverse cannot be concluded when rows of tooth marks are evident. Later swelling is apt to obscure the tooth punctures, but by that time the swelling will have revealed the nature of the bite.

DEADLY FER-DE-LANCE (iron lance) opens wide to strike. This eight-foot pit viper ranges from Mexico to tropical South America, makes itself equally at home in forests or open fields.

Q ***How many different kinds of snakes are there?***

A Some 2,500 species of snakes exist today. The numbers of species in certain parts of the world follow:

Southeastern Asia	389
Malay Archipelago	345
Mexico	336
United States and Canada	114
Europe	31

Q ***How does snake poison work?***

A Snake venoms are complex proteins not yet fully analyzed chemically. They may be divided into two types: One causes local congestion, swelling and bleeding by damaging blood cells and rupturing small blood vessels. The other depresses or stops either lung or heart action, or both. The first type is known as hemotoxic or hemorrhagic, the second as neurotoxic. Unfortunately for experimenters and victims, venoms are not pure and can be classified only as predominantly one or the other type. In general, cobra and coral snakes, as

well as sea snakes, have venoms that are chiefly neurotoxic in effect; the true vipers and pit vipers have mainly hemotoxic venoms.

Q ***Do cobras sway to the rhythm of music?***

A As snakes are deaf to sounds carried by the air, it is patent that they cannot respond to music played by snake men. The Indian charmer sways his trunk from side to side, a motion that causes the highly sensitive cobra to perform its "dance," seemingly to the rhythm of the music.

Q ***Do sea serpents really exist or are they a myth?***

A Sea serpents are a myth. The genuine sea snakes are usually but three or four feet long; nine feet seems to be the greatest length attained.

Q ***Which snake is the largest?***

A The largest snakes of the different continents (with the exception of Europe, which has no species of unusual proportions) may be listed as follows, with their probable greatest measurements, in feet:

Asia: reticulate python	32
South America: anaconda	30
Africa: rock python	25
Australia: amethystine python	21
North America: boa constrictor	18.5

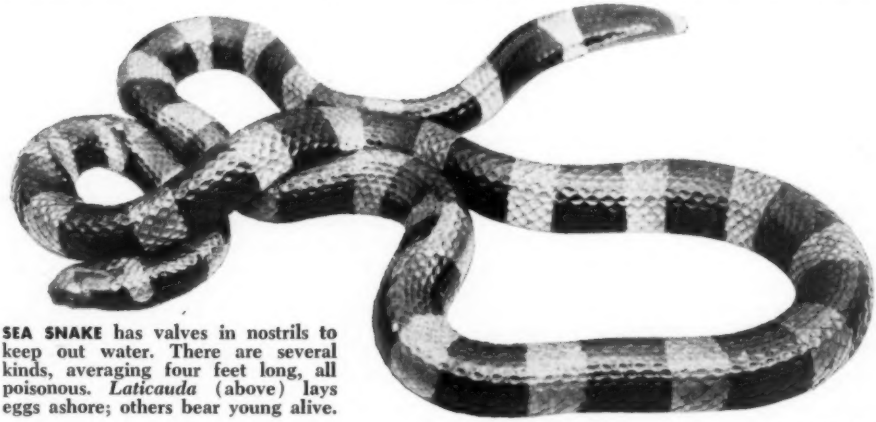
One reticulate python 28 feet long weighed 250 pounds; another, but nine inches shorter, only 191 pounds. A 19-foot anaconda tipped the scales at 236 pounds, but she gave birth to 72 young soon after; the babies averaged about three feet, two inches long.

Q ***Which snake is considered the most poisonous?***

A The tiger snake of Australia. No other land snake has such potent venom; death in man results from paralysis of the breathing mechanism. It has been calculated that a tiger snake with venom glands as capacious as those of a diamondback rattlesnake would carry enough venom to kill 400 men.

Q ***Do many people in the United States die from snakebite?***

A Probably less than 100 in an average year. M. Graham Netting of Carnegie Institute, Pittsburgh, basing his estimate on the conviction that being bitten is a sure "method of getting national coverage," puts the figure at 25. END



SEA SNAKE has valves in nostrils to keep out water. There are several kinds, averaging four feet long, all poisonous. *Laticauda* (above) lays eggs ashore; others bear young alive.

Swivel-Deck Ferry Has No Gangplank

USING an idea from its engine yards, the British Railways made a turntable of the deck of this ferryboat operating between the Scottish mainland and the island of Skye. That eliminates need of a gangplank. At dockside landings the deck just swivels to right or left, and one load of cars drives off and another drives on. Besides four cars, the little ferry can carry 80 passengers.

They Say Now . . .

DR. LEON TRILLING, MASSACHUSETTS INSTITUTE OF TECHNOLOGY: "*The full cross section of engineers in the Soviet Union have apparently not yet acquired . . . engineering 'feeling.' . . . They work by the book . . . Excellent designs must frequently be adapted to inferior execution.*"

W. C. NEWBERG, PRESIDENT, DODGE DIVISION, CHRYSLER CORP.: "*It takes a lot more than a spotless laboratory to keep a young engineer happy . . . If you bury him in a laboratory, you might as well . . . bury him in a cemetery.*"

ROLAND P. SOULE, VICE-PRESIDENT, IRVING TRUST CO.: "*A family of products . . . cannot continue to exist without . . . new members any more than a human family . . . without new children.*"

PROF. VASILI I. KOMAREWSKY, ILLINOIS INSTITUTE OF TECHNOLOGY: "*Some day our entire mineral industry will be centered around the sea. We will extract needed minerals from sea water as we now obtain much of our magnesium and bromine.*"

CHARLES J. LOWEN, ADMINISTRATOR OF CIVIL AERONAUTICS, DEPARTMENT OF COMMERCE: "*We still need a plane for the people . . . safe and not too costly.*"

Another Article About
The Other Fellow's Shop

His Shop Is a Museum

COOPER'S ADZE

"SAUCERED" ADZE BLADE

TWO-HAND DRAW KNIFE

This craftsman-collector owns 400 antique tools—but not a witchet or even a twilbil.

By Edward D. Fales Jr.

IN A basement workshop the other day a man named Arnold Zlotoff took a huge plane down from its hook on the wall.

"What men those old-time carpenters were!" he exclaimed. "Just try to push this thing."

The huge tool was a handmade joiner plane four times as long (and heavy) as the average plane that you use in your shop. End to end it measured four feet. Its use: to smooth wide-board floors, 150 to 200 years ago.

The oversized plane is just one of 400 ancient tools

TWO-HAND ADZE

SIMPLE ADZE

THIS HUGE "PUMP-LOG" AUGER was used for boring 1½-inch (inside diameter) pipes from wooden logs. Zlotoff found it in the dusty rafters of an old farm-implement shed and discovered that although it was rusty it still worked. Here he bores into a maple log; the handle is offset to provide leverage needed to turn this heavy tool. At the left is an early push-drill which is still in good operating condition.

that Zlotoff has in his collection. When you enter his bright basement, at Lakeview, Long Island, you see rows of shining 20th Century tools. But across the room are rows of their counterparts: curious sharp-clawed hammers, 200-year-old saws, twist-stick bucksaws used by early Yankee farmers, a small "horned" plane that may date back to medieval Europe, big jointer planes that the early colonists used upside down. (They held the planes and pushed boards over them.)

Zlotoff, a fine craftsman himself, has picked up his tools in old barns, sheds, junk yards and—of all places—antique shops. Some were gifts, but he usually pays 50 cents to $2, sometimes $5 or $10.

The value of old tools, however, he says, is rising, and he has gone into business selling them.

"Did you know," he says, "that carpenters for centuries have had braces-and-bits just like ours? The braces were carved from wood, the bits hand-forged."

He pulled a tool from a shelf. It looked like a hand-carved question mark.

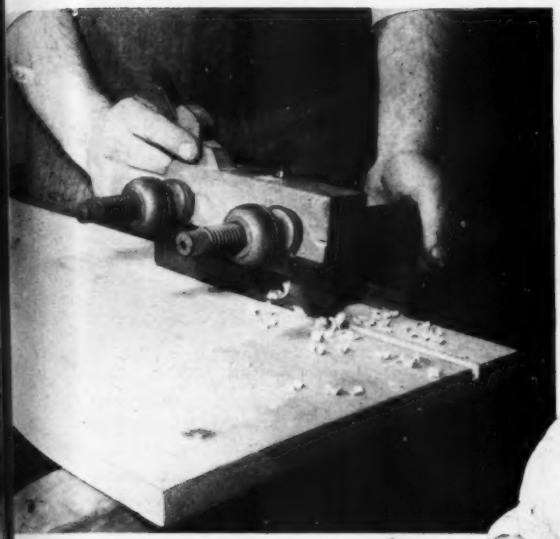
"But it still works: they *all* do," he said. He thrust a square-headed bit into a square hole in the brace. Then he pressed his shoulder against the revolving top-button and began to grind away. The old blade bit into a piece of pine. Zlotoff began to puff a little. "It's hard work," he said. "The bit has no screw-point to pull it into the wood."

Zlotoff grows so absorbed in his old tools that he lapses into the first person. "This is the kind of auger we used when we had to drill big, deep holes for mortises and for pegging together eight-by-eight and twelve-by-twelve house frames. Noah must have used augers like these to build the ark," Zlotoff says. "And I'm not kidding."

On one shelf you see a half-dozen of these spiral augers dating back to the early 1800s. Zlotoff muscled a big 3½" job from the shelf and took a few turns in a piece of hard pine. "After a few minutes of this," he says, "I always sit down and rest awhile."

Yet Zlotoff is far from feeble. A for-

Old Tools Still Work —But Require Muscle



PLOW PLANE with wood screws (above) was made from boxwood by an early American toolmaker. It still cuts a clean dado. Fence and blade are adjustable.

HEAVY JOINER PLANE (below) is a prized item in Zlotoff's collection. It was used in colonial times for smoothing off floors, which were made from wide hand-hewn boards. The plane measures four feet from end to end.

mer artilleryman who landed in France on D Day, he's husky, with strong shoulders and arms. But he was out of breath.

"You see what I mean about those old-timers!" he grinned.

Zlotoff first began collecting tools when, as a college student interested in shopwork, he bought a 130-year-old tool chest in Oswego, N.Y.

It was like a treasure chest. Five black walnut sliding drawers were filled with small tools: ancient levels, bits, chisels, gouges. Four saws were neatly stored in special slots.

That whetted his enthusiasm. One day in Cummington, Mass., he was rummaging through an old farm shed. Up in the rafters he saw a cobwebbed auger longer than any that he knew existed. He fished it down. It had a 12″ spiral bit on a shaft nine feet long.

It was an early "pump-log" auger.

Today that long boring tool hangs in a rack in his shop. "This," says Zlotoff, taking the heavy tool from its rack, "is how we made water pipes from logs be-

THERE'S NO CHUCK on this brace and bit, which dates back to early colonial America. This style was in use in Europe more than 500 years ago. It uses a center bit rather than a spiral bit.

LIVING-ROOM DECORATIONS in Zlotoff home are antique tools, too. Here Mrs. Zlotoff tries an old "shaving horse" used for making shingles. Note the twist-stick saws on the wall.

OLD LOGGER'S CALIPERS have a sliding wooden scale that tells at a glance how many board feet are in a log. Zlotoff found them among some old tools in an eastern Massachusetts shop.

fore we had metal pipes. We simply drilled down the center of eight-foot logs, then attached the logs end to end."

How did they get watertight joints?

"We used a pair of planes and made male-female fittings," he says. "One plane tapered the outside of a log end into a cone shape. The other beveled the inside of the next log to receive the cone. The resulting fit was good and tight."

Since old tools were handmade and precious, practically every one was stamped, or burnt, with its owner's name.

"The old-timers' tools were *good*," he says. "Almost every tool that I have still works.

"Here—look at this big guy. Biggest chisel I ever saw—and wonderful steel." Zlotoff hefts a massive blade four inches across. "We called it a slick . . . *OOPS!*"

The beautiful old blade slipped out of its handle and Zlotoff caught it just in time. "Got to watch it," he says. "This old handmade handle has dried out, and it's loose. Friend of mine nearly cut his toe off one day when the blade fell out."

Zlotoff is still looking for special items.

One is a witchet. This is a plane that does a job you'd do on a lathe today such as rounding handles or chair rungs.

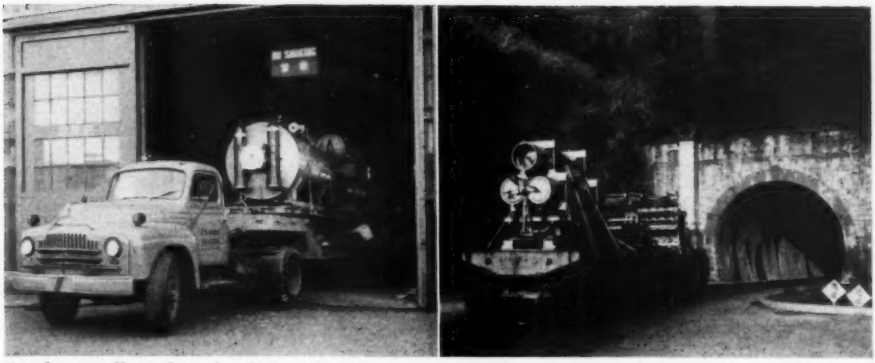
"I also want a twilbil," says Zlotoff. A twilbil is a pick-like tool used for chopping out mortises.

Zlotoff sometimes uses the old tools, but only for experimentation.

"They were wonderful," he said. "But let's not kid ourselves; they can't compare with the tools we have today." END

HEAVY WOODEN SEMICIRCLE is a cooper's croze, a husky plane used for cutting grooves in the inside of a barrel to hold the top and bottom on. This tool is more than 100 years old.

OLD-TIME LEVEL has no bubble, but a bob-like pointer. Screw feet adjust level to any angle. Measuring wheel (on wall) did a job that steel tapes do today. This one is two feet around.



Ready-to-roll trailers, loaded with rescue gear, can be on the road in a matter of minutes.

Heaviest and bulkiest equipment, including the diving bell at the right, goes into C-124s.

Rescue Gear Flown to Crippled Subs

ONE of the most dreaded of naval disasters is a submarine that can't come up from a dive. Special heavy and bulky equipment is needed for rescue operations. A few hours' delay may cost the lives of a crew trapped under the sea.

To save time, the Navy and the Air Force have set up a new airlift rescue system at Yokosuka, Japan. The rescue gear, weighing more than 56 tons, including a 7,500-pound diving bell, is kept loaded on trailers, ready to be trucked, accompanied by a trained rescue crew, to the nearest airfield. There it can be loaded on five C-119 Flying Boxcars and two giant C-124 Globemasters, and flown to an airstrip close to the scene of a disaster. Then any Navy vessel capable of lowering and raising the huge diving bell can take over the operation.

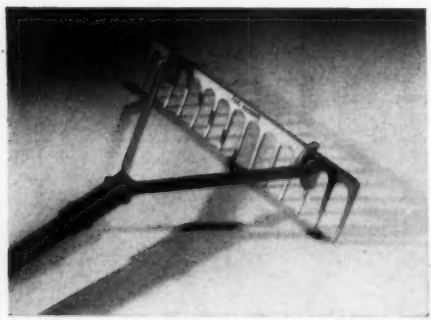
AT FLIGHT'S END, the bell, which fits over escape hatch of sunken sub, is unloaded first.

New Aids to Living

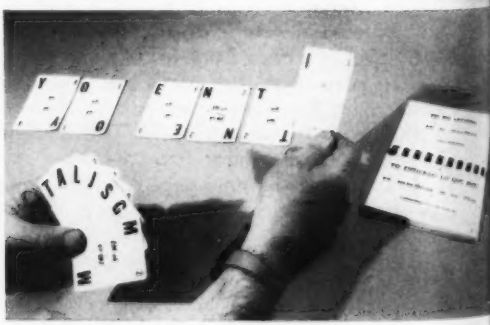
1 No-stoop, no-squat stand clips onto a round, square or oblong basket to ease the job when a laundress hangs or irons clothes. It can also be fixed to a scrub pail, to save bending when you wash down walls.

2 Two-faced blanket for boat bunks and camp cots doubles as a picnic cloth. Made of Dynel, the fleecy side is as warm as wool, says the manufacturer, but the fabric won't shrink, is moth-proof, mildew-proof, washable and fast drying. A plastic covering on the opposite side sheds water and can be wiped clean with a damp cloth.

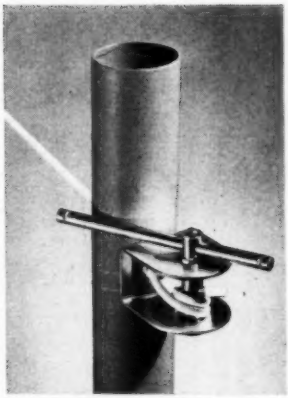
3 Self-cleaning rake rids itself of debris when you push against it. A stop pivoted on a bolt in each fork keeps the tines correctly angled as you rake. When you reverse direction, the hinged top bar folds inward and grass or leaves are scraped free of the tines by the ground.



4 Teaching cards make a new game that helps you learn foreign languages while playing. It's similar to rummy and canasta. Players score by building sentences from cards in their hands or drawn from the stack. Decks are made in English-French and English-Spanish.



5 **Insulated jug** for hot or cold drinks is equipped with a quick-on-the-draw built-in pump. You never have to lift or tilt the jug. Just hold a glass under the spigot and squeeze the rubber bulb on top.



6 **Clothesline tightener** reels in plastic or wire lines. To tauten the line you turn a handle that slides in a hub to bypass the pole. The pull of the line locks the handle against the pole.

7 **Garden guide line** lets you edge lawns or lay out seed beds like a pro. A 25-foot cord stretches between the stakes, and a spring at one end keeps the line taut, snaps it back if it's hit by the spade.

8 **Flue on camp stove** lets outdoor cooks control heat and smoke. The flue pipe is fitted with a damper, and there's a draft door at the front. The 20-pound stove has a five-square-foot cooking surface. The flue pipe and two mesh warming plates are tucked into the firebox for transportation.

9 **Dog perfume** and flea bane spurt from a new aerosol bomb at the press of a button, making Rover both a gay dog and a placid one. The spray is held about 12 inches above the dog and applied all over his body while the hair is fluffed so that the deodorant and flea repellent can penetrate deep into the fur.

More information *about the products shown on these pages can be obtained from: 1. Mohawk Valley Sales, P.O. Box 303, Ilion, N.Y.; 2. Charles Ulmer, Inc., 175 City Island Ave., New York City 64; 3. Wesley Production Co., 712 W. Jefferson St., Kokomo, Ind.; 4. Games of the Month Inc., 115 W. 29th St., New York City 1; 5. Hamilton Metal Products Co., Hamilton, Ohio; 6. Deane Smith Sales, 3930 Urbandale Ave., Des Moines 10; 7. The Bobrus Co., P.O. Box 298, Fairfield, Conn.; 8. Ranier Mfg. Co., 6129 S. Manhattan Pl., Los Angeles; 9. Plasti-Kote, Inc., 9801 Harvard Ave., Cleveland 5.*

"Take care, Wilson,"

Gus Follows a False Trail

The Model Garageman never expected to see the day when an old hound dog would give him a trouble-shooting lesson.

By Martin Bunn

WHEN the aging, mud-spattered station wagon drove up to Gus Wilson's gas pumps, the genial proprietor of the Model Garage moved to attend it. Beside the driver, an oldster in dire need of a haircut and shave, sat the largest, most flop-eared and sad-eyed hound dog Gus had ever seen.

"Are you Gus Wilson?" the old fellow inquired, peering at the Model Garageman with eyes as clear and blue as a mountain lake.

"I'm Wilson," Gus told him. "What can I do for you?"

"If you're as smart as I've been told," the old man countered, "you'll know without me telling you."

Gus chuckled as he cocked an ear to the motor, which was running in a series of staggering gallops.

"Any mechanic who didn't suspect that you had carburetor trouble wouldn't be worth his salt, mister," he declared.

"My name's Smoot—Hank Smoot," the driver said. "I've got a farm up on Peavine Mountain a way. Came to town yesterday to shop and figured on being home last night. I've got 30 miles to cover before dark. If I'm not home tonight, Pete and Patty'll be put out with me—Patty has rheumatiz. I imagine Jasmine will get along—sleeps most of the time, anyway."

The old man's eyes held a fond look. "Cuddly little lady, though. This is the first time I've been away from home overnight since Ma died. Should have been home last night, but the car got to bucking on me. You know, Wilson, sometimes I think a man's a fool to monkey with automobiles. I recall, back in the old days, when I drove a pair of mules, I was always certain of getting back. I got along fine."

"If you'll drive into the garage up to the workbench," Gus cut in, "I'll get to work on your car."

"Right you are," Smoot declared, shifting into gear, continuing to talk above the roar of the motor.

"Carburetor trouble, eh?" he yelled. "It's about time I found a mechanic who had something besides bone above his ears."

IN THE garage, he turned off the motor and got out of the car, the hound dog following him. Gus couldn't resist stroking the dog's head. The hound responded by rearing up to place huge forepaws on Gus's chest.

"Take care, Wilson," the old man

the old man said. "He's apt to snap an arm off you."

warned. "He's apt to snap an arm right off you."

The hound lapped at Gus's face with a sandpaper tongue.

"Vicious, isn't he?" Gus said dryly. He pulled away, gave the dog another pat and then turned to the station wagon. His ear had told him that here was a car with a badly fouled up carburetor, perhaps caused by leaky intake gaskets. His hunch seemed well founded when he discovered that the nuts holding the intake manifold to the block were loose. Tightening these, however, brought no results. Gus attached his vacuum gauge to the motor, and finding an extremely low vacuum reading, removed the carburetor.

"Ah!" said Smoot, who was watching every move. "You put your finger on it first clatter. Well, now, I always say it's what's above a man's ears, rather than the heft of his shoulders, that makes the difference. What's wrong here, Wilson?"

"Ah, here it is . . . Centerville 12 miles."

"My guess," Gus told him, "is a faulty gas mixture, caused by an air leak somewhere in the intake system."

Gus took the carburetor down, blew out the jets, set the float level, checked the butterfly cross-arm shaft for side play that might admit air, then checked all gaskets carefully, including the air-horn gasket. He put the carburetor back and started the motor. It ran as raggedly as ever.

"Guessed wrong, eh," Smoot said, and real worry came to his eyes. "Well, a man's entitled to a wrong guess or two, I reckon. But let's not guess wrong too often, Wilson. I got to get home tonight. My stock will get along, being on pasture, but Pete and Jasmine and Patty are locked up in the shed."

"Locked in the shed!" Gus exclaimed.

"That's right," Smoot said. "You wouldn't think a cat and dog and a pet skunk would get along together, would you? But they do. Pete, the cat, takes care of the rats. Jasmine handles the mice when she ain't asleep. Patty's the mother of old Blue here, though you wouldn't think it to look at her. How she ever managed to whelp a pup like Blue, I don't know—Blue's the best trail hound in the state."

Gus coughed. Patty and Jasmine and Pete—he'd thought they were Smoot's motherless kids. He'd been breaking his neck hurrying for a herd of animals. Now what was wrong with this rig, anyway? Leaky intake gaskets, he'd bet; while those manifold nuts were loose they might have burned. It could be burned intake valves, of course, but there was something about the way she sounded when she came in . . .

GUS broke out a new set of intake gaskets, pulled the intake manifold and installed them. When he started the engine it still ran with that peculiar galloping action.

Gus abandoned the idea of making a rush job out of the wagon. He went to work systematically, realizing that he had been fooled by a strong first hunch into hasty action. He removed, cleaned, set and tested the spark plugs, checked timing and cleaned and set ignition points, pulled the valve cover and set the valve tappets, thinking that intakes might possibly be riding open. When he started the motor he found that the vacuum still read the same on the gauge. If he hadn't set tappet clearance, he'd have sworn that the valves were riding open, with badly worn rings and cylinders tapered like ice-cream cones.

The thought brought a wary look to Gus's eyes. No, it wasn't worn rings and tapered cylinder bores. The carbon on the spark plugs had been dry, indicating

[Continued on page 212]

Plastic from a Bottle Patches Almost Anything

By John Burroughs

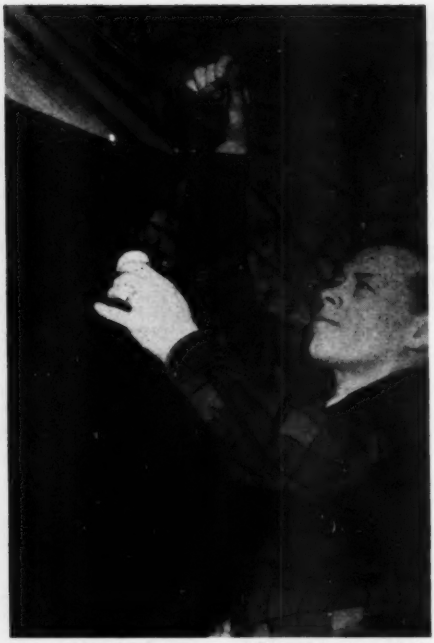
WITH the plastic repair kits now appearing on hardware-store counters you can mend, reinforce, patch, fill, cement, join or seal practically anything. That is what the instructions say and they don't seem to be an exaggeration.

I have successfully used patching plastic on wood, metal, glass, ceramic and concrete. The only common materials it won't stick to are paraffin and plastics such as vinyl and polyethylene. Once cured, the patch resists heat, water, gasoline, oil and most common solvents.

There are two kinds of patching plastic: polyester and epoxy. Polyester resin adheres well to wood and to itself; it is usually harder but more brittle than epoxy. Epoxy sticks tenaciously to most other common materials; it is the tougher (and costlier) of the

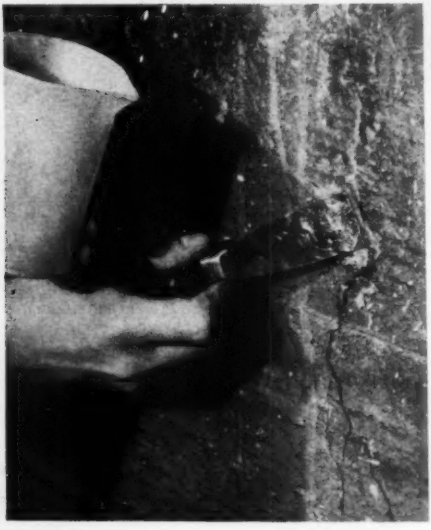
DROPS OF CATALYST start a chemical reaction that turns liquid resin into a tough solid plastic. Many patch kits have cups and sticks for mixing.

SOLID FILLERS add strength to the plastic mix. Wide variety includes powdered metal (vial, far left), sand (envelope), glass fibers and glass cloth.



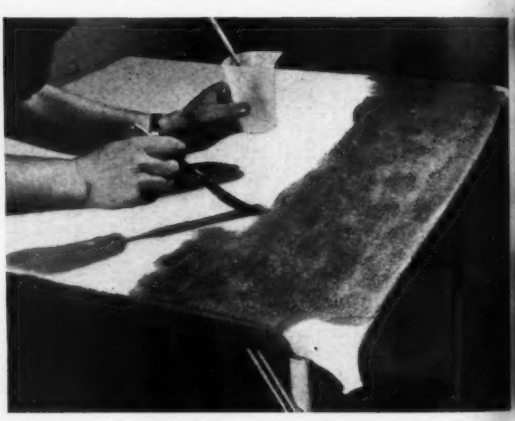
PLUG LEAKING GUTTERS quickly with glass cloth and epoxy resin. After scraping off paint and rust, brush on resin and press a cloth patch over the break. Brush more resin on patch.

FILL CRACKS IN CONCRETE with milled glass fibers that are bonded together in resin. For added leak insurance you can cover the filled crack with a strip of resin-soaked glass tape.



Plastic plus fabric give

1 HOMEMADE PLASTICIZED FABRIC is just ordinary cloth brushed with patching plastic. Experiment with several fabric samples before you start working on the card table itself.



4 FABRIC, its weave aligned with edges, was stretched over top, tacked at sides, then saturated with plastic. Air bubbles must be worked out. Corners were left free for first coat.

two resins. Packed in most kits you will find stirring sticks and paper mixing cups (in some, the cups are even marked for measuring).

The patching ingredients are:

- Resin, a clear syrupy liquid.
- Catalyst, a clear liquid that may be syrupy or water-thin.
- Filler, a solid of some kind—powder, fibers, matting, or glass cloth.

The catalyst. This is the agent that turns liquid resin into solid plastic in a

beat-up card table a handsome and durable new top

2 REMODELING CARD TABLE involves only replacement of sagging cardboard top with a new one made from plywood, cloth and plastic. Old top came off after tacks were pulled out.

3 PLYWOOD SQUARE, same size as the old top, was worked over with a power sander to rough up the surface. The edges were beveled on the underside, and the corners rounded.

5 TO FASTEN CORNER, V-shaped notch was cut so that edges butted without overlap. The fabric was then tacked and coated with plastic. This step was done with the top upside down.

6 ADDITIONAL COATS of plastic built up the surface, each coat being smoothed with fine sandpaper after it had set. A final buffing on the last coat gave the table top a soft sheen.

few hours. Catalysts are not all alike; they must be teamed up with the right resin or there is no magic, just mess.

Filler material. Fillers are optional additions to the resin. Like the aggregate in concrete, they thicken the mixture and add both strength and bulk. Some half-dozen types of filler are available, each suitable for a particular repair. Glass cloth is the most common filler, especially for bigger jobs.

Mix just enough plastic at a time to handle the project of the moment. You can't pour back unused resin that has already been catalyzed. If you find it difficult to measure accurately, add more rather than less catalyst.

Filler is added after resin and catalyst have been completely mixed. You can impregnate glass cloth or tape by brushing on catalyzed resin with a dime-store paintbrush (throw the brush away later). Lay the fabric on waxed paper and saturate each side in turn. Then

BIG HOLES in auto bodies, mufflers or gas tanks are a cinch for patches of glass cloth brushed with epoxy resin. Extremely strong when cured, the patches are impervious to gas and oil.

NEWER "LIQUID SOLDERS" are often a powdered metal filler suspended in epoxy resin. They plug any open joints in air ducts, home or auto radiators. The paste cures without shrinking.

press it in place and let it cure. Be sure to press out all bubbles.

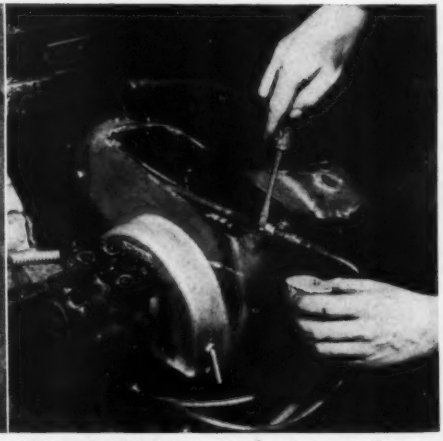
These patching plastics, called low-temperature thermosets by engineers, are already well-known in industry. Reinforced-plastic auto bodies, boat hulls, aircraft parts and protective coatings all use them.

How do they work? A plastic resin is like an open latticework of countless short chains of molecules. When you add a catalyst, you start a chemical reaction, called polymerization, which links and cross-links the chains, filling spaces between them to form a solid mass. The chemistry is awe-inspiring and so are the chemicals—one catalyst for epoxy resin is based on hexachloroendomethylenetetraphthalic anhydride.

Use with caution, in a well-ventilated place away from flames. Avoid getting them on your skin, and keep them well away from your eyes.

Some—but not all—catalysts are poisonous. So keep them away from children and, unless you know that the materials you have are not poisonous, don't use them to repair objects that children might chew on. Handle fillers such as milled glass fibers cautiously, especially around food.

TAPE A SPLIT WATER PIPE with a strip of glass cloth saturated in catalyzed resin. Cold pipes should be warmed beforehand to ensure thorough curing of the plastic. An infrared lamp (above) is a handy heat source for such jobs.



STRIPPED THREADS in an aluminum casting can be restored by plugging hole with metal-filled epoxy resin. To make threads, insert screw, protecting it with a thin coat of melted wax. Let the new threads cure thoroughly. END

New for Your Car

1. Car Powers Vacuum. The intake-manifold vacuum, which runs many windshield wipers, powers this cleaner for a car interior. You slip the vacuum-cleaner hose onto a valve fitting mounted in the glove compartment. Another hose connects the valve to a tee inserted in the wiper hose, which is first cut in two. Cars that have electric wipers require a special hookup.

2. Plug Defers Oil Change. A special drain plug with a slug of highly positive metal greatly prolongs the life of a car's oil, according to the National Research Council of Canada, which backs a new plug using a calcium alloy (left). Magnesium-alloy plugs have been sold in the U. S. for some time.

3. Magnetic Case Sticks to Dash. Your sunglasses will always be within easy reach if kept in this case. Two magnets sewn into the back hold the case snugly against the car's metal dash.

4. Wax Has Built-in Cleaner. This new paste cleans road film off your car and puts on a coat of wax at the same time. Buffing gives surface a durable shine.

More information *about these new car products can be obtained from: 1. Home Products Co., P.O. Box 203, Bloomfield, N.J.; 2. Positive Metals of Buffalo, Inc., P.O. Box 298, Buffalo, N.Y.; 3. Gray's Limited, 247 So. Catalina St., Los Angeles 4, Calif.; 4. S.C. Johnson & Son, Inc., 1525 Howe St., Racine, Wis.*

12 Ways to Use Block Planes

These versatile one-hand shavers will take the edge off many tough jobs, from fitting doors to making dowels.

By Edwin M. Love

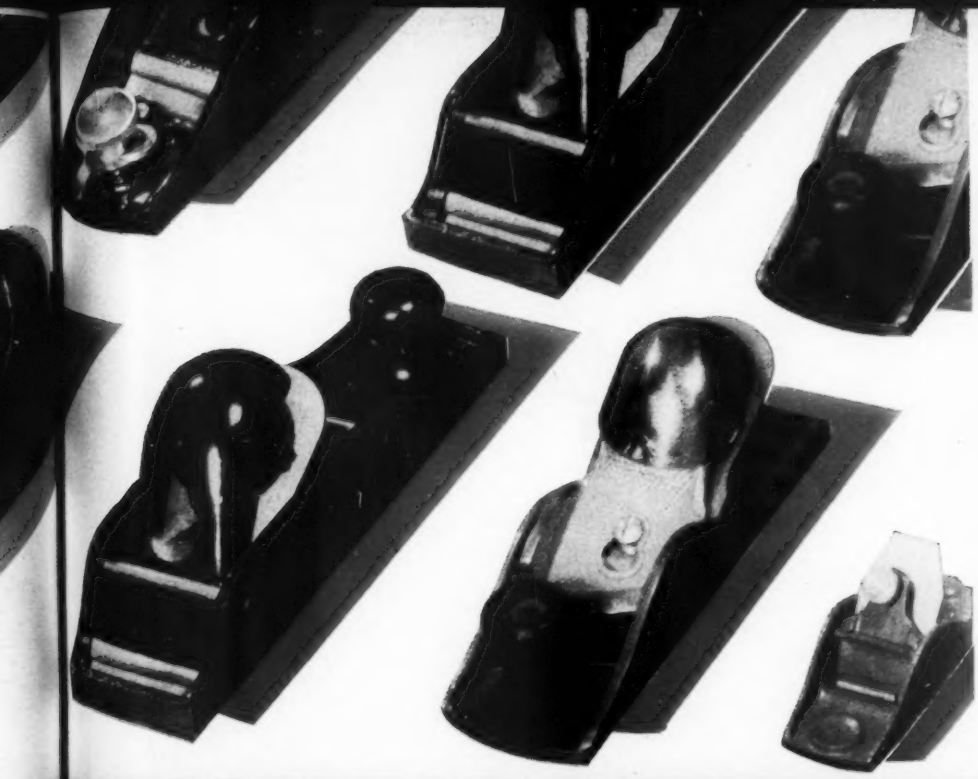
BLOCK planes were first used to dress the ends of clapboards while "blocking in" the sides of houses. And they are still the best tools for trimming end grain. But their small size makes them valuable for many other jobs, as pictures on these four pages show.

You hold a block plane with one hand, so it is your first choice when you need your other hand to steady the work. You can get it into tight places and work it around curves, inside or outside.

The simplest type consists of a body and a low-angle cutter. You adjust the shaving thickness with a hammer tap on the cutter. More elaborate models have screws for adjusting the depth of cut, lateral levers for evening the cutting edge, and locking cams for varying mouth-width.

When you sharpen a block plane, remember that the blade is beveled on the top edge instead of the bottom. That's because it cuts at a low angle. Round the corners to minimize unwanted marks.

1 **DRESS END GRAIN** with a block plane—that's its specialty. Small size makes it easy to hold in one hand; light pressure reduces the chance of splintering the wood. Note grip on plane.



2 LINE UP A MITER, as on this long piece of molding, with a guide. Slide the plane sideways against a thin strip of wood or hardboard that raises the work to the cutter level.

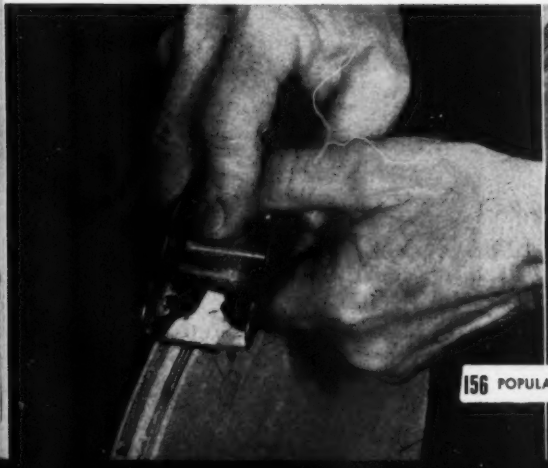
3 CHAMFER SMALL PIECES easily with a light block plane. Work toward the center of the board on end grain (upward in the setup shown here) to avoid splintering the wood.

Please turn the page for more about block planes

4 MAKE A TENON FIT by planing off excess wood where it binds in the mortise. You have to cut across the grain for this job, and that is just what a block plane is designed to do. The plane shown here is of medium size, but others range from 3½" to 8" in length. All are comparatively inexpensive tools—some of the utility models sell for less than a dollar.

5 SMOOTH OUTSIDE CURVES on plywood by taking short, light cuts. Take care: Outside plies splinter easily. It may help to turn the plane slightly crosswise to the stroke.

6 PLANE SHALLOW INSIDE CURVES by extending the cutter so that it will touch the work. Hold the tool at a 45° angle to the work to bring it closer. It smooths faster in that position.



7 WORK IN CORNERS with a double-ended block plane, which has its cutter way up front. This makes it handy for dressing the top of a binding door right up to the hinged side.

8 TRIM HARD-PLASTIC COVERINGS along the edges by skewing the plane toward the undersurface to which the laminate is cemented. Do final touching up, though, with a mill file.

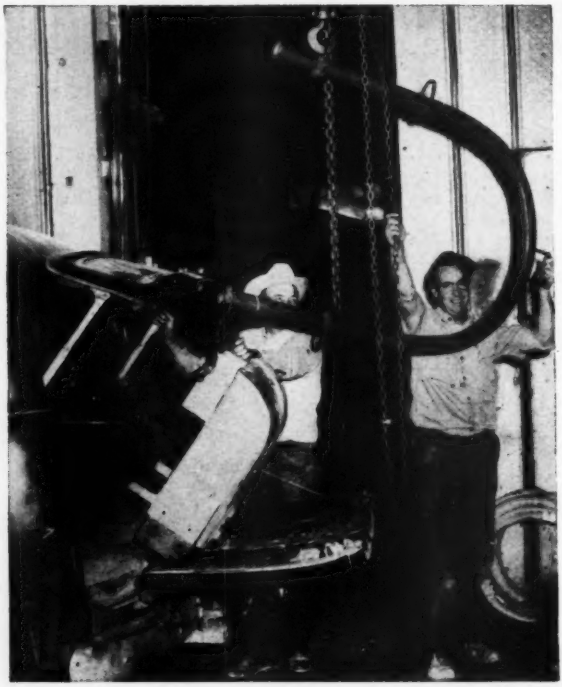
9 SMOOTH RABBETS right up to inside corner with block plane that sheds one side so cutter can reach in. It works on small pieces where an ordinary rabbet plane would be clumsy.

10 SHAPE ROUND SURFACES, such as this model-boat bottom, with a modelmaker's plane. It is the smallest block plane made and is useful for shaping the most intricate pieces.

11 MAKE EMERGENCY DOWELS quickly by chamfering the corners of hardwood sticks ripped square. After finishing half of the stick, turn it end-for-end and finish the other half.

12 TURN PIECES ON A LATHE with block plane, which excels at making long, slender rods. Support work with pad or glove; run plane along it while it turns at moderate speed. END

U-Shaped Arm Helps in Hoisting Heavy Stuff



THIS big hook makes snaking out and unloading heavy equipment from a panel truck or station wagon a light, fast job. The hook is 2½" pipe bent into a U. Steel rings at two positions near each end allow adjustments of rigging. A handle welded at the center guides the arm. Hung from a chain hoist, the hook can poke its lower end inside the vehicle.—*Harry J. Miller, Sarasota, Fla.*

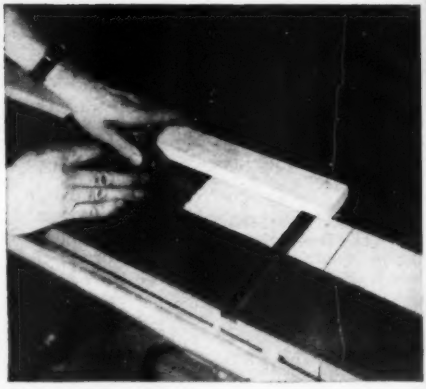
▶▶▶You can make smooth cutouts in sheet metal with the help of a 1¼" length of rattail file in an electric drill. Lay out the work and drill a series of holes inside the mark. Then chuck the file in the drill and rotate it around the jagged edge to make a smooth opening.—*Robert Irving, Walpole, Mass.*

Pencil Cutter Does Planing

A SPIRAL fluted cutter from a pencil sharpener will do an excellent job of rotary planing in a drill press. It is especially good on curved edges. Used with a fence, it will joint pieces up to ¾". The cutter should be mounted on an arbor, such as a bolt cut off at the head.—*L. H. Weber, Havana, Ill.*

Beveled Screws Start Easier

MACHINE screws enter newly tapped holes easily if the ends are beveled, leaving three equally spaced spots carrying the thread. The narrow ridges engage the threads in the hole quicker than an unfiled, fully threaded end.



Paint Gauge Sets Saw Cuts

CUTTING duplicate pieces can be almost automatic with this trick. Paint a white line on your saw table and pencil a mark where the end of the board rests. When the pencil marks become too numerous, scrub them off or, if necessary, repaint the strip.

Quick Touch-ups Keep Your Car Looking New

It's easier now to repair those small nicks and scratches with new paints and fillers that are designed for amateurs to use.

By Steve Mashek

THEY'RE pretty pleasant, those first months with a new car—the ones before a post reaches out and gouges a fender or some guy slaps his car door into yours.

In spite of occasional goofing, you can stretch those months into years of the new-car look with judicious touching up. New products make it easier than ever to get rid of dents, pits, scratches and gouges—and to beat rust to the draw. They are designed for amateurs to use. You won't need body solder or grinding tools, just water sandpaper and putty filler.

The simplicity of applying self-spray finishes now offered for most recent cars makes them first choice for the job—if you have a late-model car. They come in the familiar pressurized cans like other paints and insect sprays.

Some makers offer them as part of a complete touch-up line. You can get a finish to match your car, gray primer to

go on any spots where bare metal is exposed, overspray leveler to smooth down the new paint job, and tubes of putty filler and rubbing compound.*

If your car is several years old, you may not find spray-can paint to match it. The dealer who sold your car to you will probably have matching paint on hand in his own shop. You'll have to apply it with a brush or regular spray gun. Many car dealers and accessory shops also stock small bottles of the touch-up enamels called Dupli-Color to match almost every car on the road. For '55 and '56 Chrysler Corp. cars, you can use a little "fountain pen" that dispenses matching paint.

If other sources fail, a dealer in automobile finishes can make up paint to match any standard car finish, just as he would do for a whole repaint job. You can usually get a small amount—it will be more than you'll need—for a couple of dollars or so.

Cleaning is probably the most important part of a touch-up job. Poor paint will stick reasonably well to a clean car, but the finest product won't perform decently on a dirty one. Wash your car carefully, especially if it has been waxed with a silicone polish. Any trace of silicone will produce spots easily recognizable from their names: craters and fish-eyes. If you get these, wipe off the finish and clean again very carefully.

**Tempo Products Co., 2075 E. 65th St., Cleveland 3, Ohio, makes these touch-up materials and spray cans of paint to match Chevrolets '53 and later; Fords '54 and later; Plymouths, Buicks, Oldsmobiles '55 and later.*

1 THOROUGH CLEANING is more important for a smooth touch-up job than painting technique. Give damaged area an extra washing after you clean car. Wipe with dry, clean rag.

Do all sanding wet. This avoids scratching, keeps down dust and reduces the silicone problem. When sanding, feather out the edges of the damage so that they will blend inconspicuously with the surrounding area.

With straight scratches, sand lightly along the scratch until the finish at the edge is very thin. Don't make the area larger than necessary. Avoid cutting down to bare metal if none is already exposed—or you'll have to use a primer. Finish with a rotary motion. If the bad spot is round, do all the sanding with a rotary motion. On corners and edges,

SPECIAL SPRAY GUN screws into a spark-plug opening and uses engine compression. It is made by manufacturer of Dupli-Color touch-up paint, which is available to match nearly all cars.

FOUNTAIN-TYPE TOUCH-UP BRUSH comes with colors to match recent Chrysler Corp. cars. When top is removed, a spring snaps the brush into position and starts the paint flowing.

2 WET-SAND the damage with No. 400 abrasive paper. Use light strokes; don't try to hurry the job with heavier abrasive paper. Match strokes to shape of damage; feather the edges.

3 CLEAN AGAIN after sanding. Use an oil-free solvent—naphtha, lacquer thinner or white gasoline. Be sure you remove any silicone polish on the car. This causes bad spots in finish.

4 MASK with paper and tape if you spray primer or if chrome or second color is nearby. Don't mask too close. If damage is quite small, you can use hand-held cardboard shield as mask.

5 SPRAY PRIMER if bare metal has been exposed. Let dry an hour, wet-sand with No. 400 paper, and wipe surface off with naphtha. Skip priming if the metal has not been bared.

sand in a straight line but very lightly.

After sanding, wash with water and dry carefully with clean cloths. Then rewash with solvent and wipe off the area with fresh clean rags.

When spraying, it's important to keep your proper distance. For spray guns this may be as little as three inches. The safe thing to do is to test the spray first on a tin can.

Self-sprays require a much greater distance—at least 10 inches and often 12 to 15. Otherwise you won't get all the propellant out and may wind up with bubbles in the job. Be sure the can has been stored at ordinary room tempera-

6 PUTTY FILLER, available in small tubes, will make dents disappear. Let filler dry an hour or so, sand it down smooth and level, then spray on the primer as shown for bare metal.

7 NOW SPRAY ON COLOR. Job above was done with standard gun, directly from bottle of finish bought from car dealer. Spray can is easier if you can get color to match your car.

8 OVERSPRAY LEVELER gives the professional touch. Tear bigger hole in your mask and spray all the new paint, the spray mist that has gone over the old finish, and a little more.

9 RUBBING COMPOUND finishes the job. Use it to remove paint dust from surrounding areas and to smooth touch-up paint. Now protect your newly perfect car with a good polish job.

ture (or warmed in lukewarm water). Shake it vigorously before spraying so that the metal agitator inside breaks loose and stirs the paint.

Masking is a good idea if your spraying technique is a bit shaky. It is essential if you are spraying primer, or if the adjacent areas have chrome or another paint color.

For narrow scratches and small nicks, you can use a simple shield made from a piece of cardboard, such as the stiffener that the laundry puts in a shirt. Cut a round hole in the cardboard for a nick, a long narrow hole for a scratch. Make the hole only slightly bigger than the damage.

Hold the cardboard shield about one-half inch away from the car, lining up the hole with the damaged area, and then spray the paint as usual.

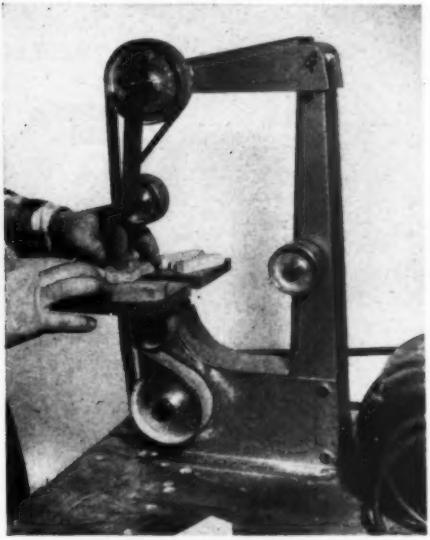
When you finish, you'll have some of that new-car pride back. And the old bus will even seem to run better. END

New Tools

1. Tool Fastens to Masonry. With this new tool and a hammer you can drive tough steel fasteners directly into masonry or even through ¼" steel. You need no drilled holes, toggles or expansion shields. The trick is in the way that the tool supports the fasteners to prevent buckling as they are forced into hard materials. The tool can drive nail-like pins or threaded studs of various sizes.

2. Saw Is Level and Square, Too. Three tools are rolled up into one in this new saw. The blade and handle make a square, and there is a spirit level in the handle. The saw comes with three interchangeable blades—metal-cutting, compass and keyhole—which rotate.

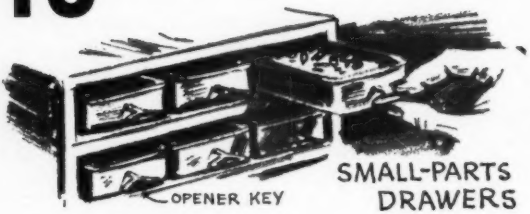
3. Scraper Becomes a Sander. A new attachment for a paint scraper converts it to an easy-to-use hand sander. You lock the clamping plate by tightening a knob. The plate holds a 2½"-by-9" strip cut from a sheet of sandpaper.



4. Band Sands Inside Holes. This ribbon sander has a band that can be threaded through openings as small as ⅛" by 1". You can work to the center of pieces as wide as 14½", and the table tilts for angle or bevel sanding. Bands are quickly changed and come in ¼", ½" and 1" widths. Besides sanding wood, metal and plastic, the machine can also be used to shape, grind, de-burr or sharpen.

More information *about the products shown on these pages can be obtained from: 1. Olin Mathieson Chemical Corp., 460 Park Ave., NYC; 2. Harnell Mfg. Co., Inc., 105 E. 16 St., NYC; 3. Hyde Mfg. Co., Southbridge, Mass.; 4. Mead Specialties Co., 4111 N. Knox Ave., Chicago 41.*

10 USES FOR Sardine Cans



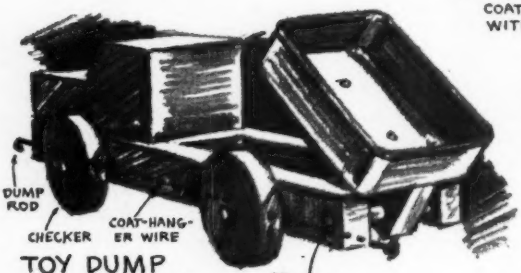
SMALL-PARTS DRAWERS

SEEDLING TRAY

SOAKING OILSTONE

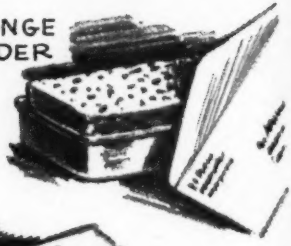
DEVELOPING TRAYS

COAT CANS WITH PARAFFIN

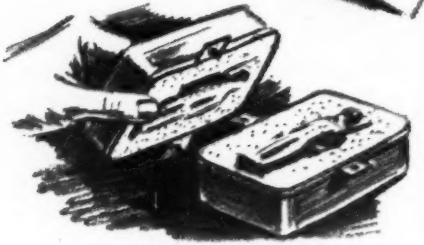


TOY DUMP TRUCK

SPONGE HOLDER

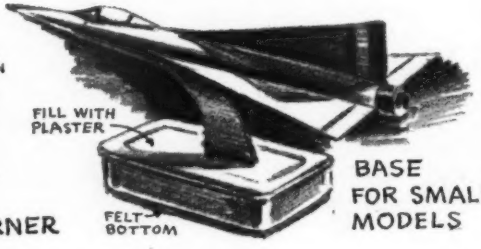


WASHING SMALL PARTS



SAND CASTING

KING-SIZE ALCOHOL BURNER



BASE FOR SMALL MODELS

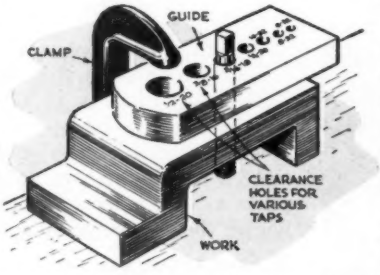
New Shop Ideas

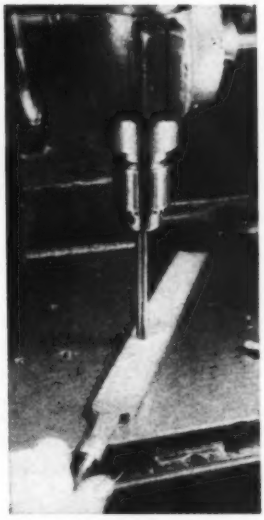
Tailstock Sizes Cutoffs. Whether tolerances are small or large, using the tailstock as a cutoff gauge is a time-saver. The photo shows such a setup for cutting a number of 10″ lengths from ½″ steel bar.

A piece of ½″ bar or a taper shank faced square at the end is mounted in the tailstock. With the carriage locked near the chuck, the tool is set to part off without leaving a center pip. Stock fed through the spindle is faced off. It is then moved out to part off at the desired length, and the tailstock is locked against a small block held between work and stop.

With the block removed, the piece is cut off and caught by the right hand. Again the bar is advanced, with the block between it and the stop. The block is necessary; without it, the work will jam as it is cut free. Use a three-jaw chuck—collets retract work slightly, causing inaccuracies.—*J. C. Magee, Schenectady, N. Y.*

Starting Taps Straight. Hand tapping will produce true threads if you make a guide plate like the one below. In a steel plate at least ⅜″ thick, drill clearance holes for the taps that you use frequently. Place the guide on the work, over the hole to be tapped, clamping it lightly until the tap is centered. Then clamp it tight. Turn the tap in far enough to start it truly before removing the guide. A hole may of course serve for more than one tap if the major thread diameter is the same. —*Frank LaSaracina, New York City.*



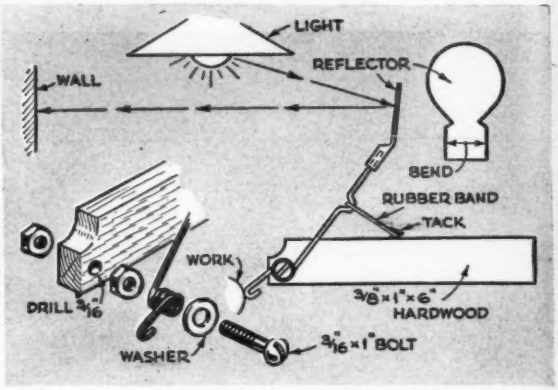


Facing in Drill Press. The ends of short rods and pins can be squared off quickly in the drill press. Lay a flat mill file on the table, chuck the rod or pin, and with the work spinning, bring it down on the file. The sharp edge can be chamfered with a touch of the file hand-held at a 45° angle.

This easy and accurate method will also locate the center better than lines scribed with a centering square. The faced end will show a pattern of concentric rings with a clearly defined center mark.—*H. J. Gerber, Stillwater, Okla.*

Please turn the page for more shop tips

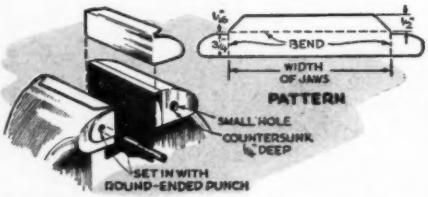
More Shop Tips



Light Helps True Up Work. This simple indicator for setting up work in the lathe can be made in minutes. It uses a reflected light beam to multiply out-of-true movement, making errors as small as a thousandth easy to detect.

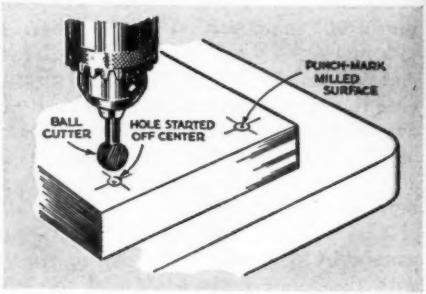
Wind 1/16" brass welding rod or stiff wire around a 5/32" rod, shaping the ends of the coil as shown. Spring the coil open to a close fit on the shoulder of a 3/16" bolt. Mount this on a bar sized to fit the tool post, using a washer and two nuts.

Crimp a piece of bright aluminum or tin-can stock to the end of the wire and add a rubber band as shown. Turn the reflector to throw a spot of light from the lathe lamp on the wall or ceiling 6' away.—*Randolph Lucas, Roanoke, Va.*

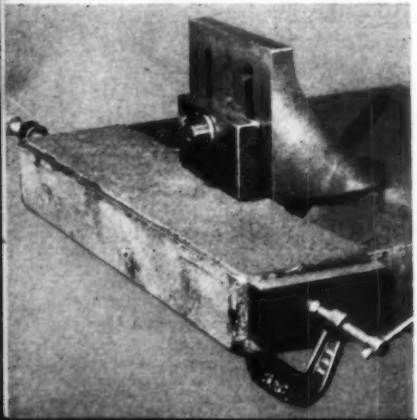


Vise Facings Snap On. These soft jaws for a vise can be mounted or removed instantly, and are quickly made.

Cut two pieces of 1/32" sheet copper or soft aluminum as shown above. Drill and countersink shallow recesses in each side of both vise jaws. Align the metal blanks in the vise, clamp them, and bend as shown. Then punch the soft metal into the recesses with a round-ended punch.—*R. Love, San Marino, Calif.*



Relocating a Hole. When a drill starts off center, the error can be corrected with a ball cutter. Use it to mill out a shallow cavity, removing the false start. The resulting smooth area can then be punched at the right spot.—*Hugh Lineback, Stillwater, Okla.*



Hand-Lapping Flat Work. Accurate flat surfaces can be produced by rubbing work on abrasive cloth that is drawn uniformly taut on a truly flat surface.

Use the drill-press table for the flat surface. Clamp the abrasive strip tightly to one edge with a block of wood as at left. Clamp another block on the opposite edge only moderately tight. Tap down on this block to stretch the abrasive. Then tighten the clamp well. Mount work on an angle plate, as shown, for accurate lapping, and rub evenly over the whole abrasive surface.

Our Camping 'Trailer' Has No Wheels

By
Darrell Huff

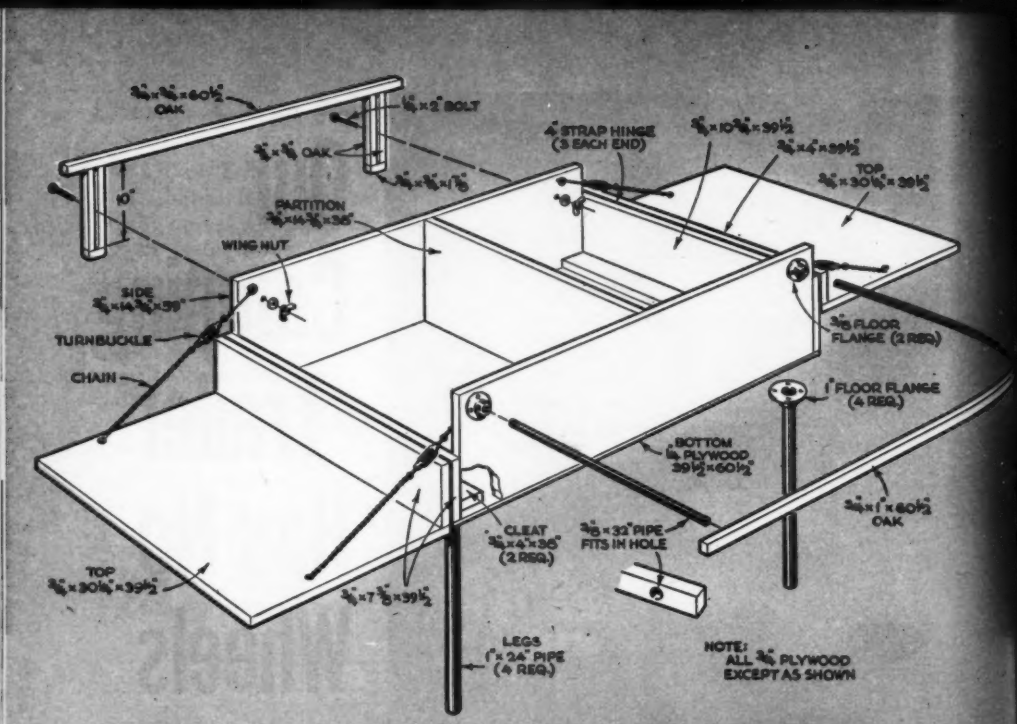
WHEN we go camping we live around—and under—a box that we find better than a trailer. It weighs only a fraction as much as a small trailer, doesn't wag our car on curves, and never jackknifes when the back-up lights go on.

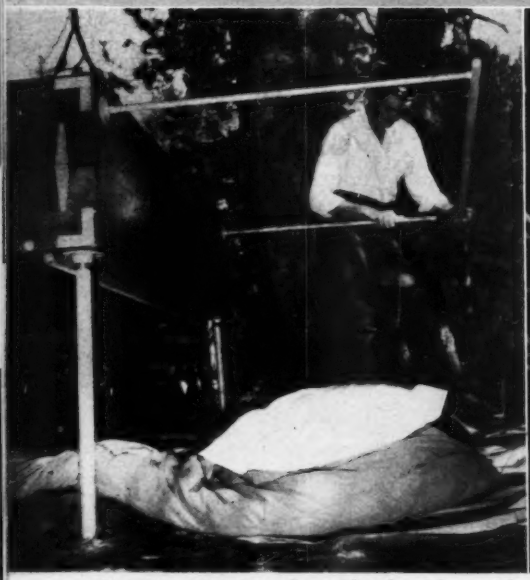
It's a camping box—a sturdy, many-uses rig that fits neatly into the rear of our station wagon. Low enough to give us an unobstructed view to the rear, it's still spacious enough to carry all of our gear to a camping site. On location, out of the car, it works every minute: as a work counter, storage cupboard and picnic table by day, and as a cozy shelter for three at night.

Between trips it serves still another purpose. Flat against a house wall, it becomes a handy, outdoor closet where we store our camping paraphernalia.

CAMPING THE ORDERLY WAY begins when we slip our "trailer without wheels" into the station wagon and pack it with gear (top photo). Closed, the box extends just flush with the lowered tailgate, doesn't interfere with seats. At camp (above) the girls use its "dining area."

Please turn the page for more about the camping box





SLEEPING QUARTERS? Sure. The closed box, with food and extra duffel stored inside, becomes half of a sturdy roof. A frame for the other half goes up in a jiffy. We thread two lengths of pipe into another pair of flanges, and connect the outer ends of the pipe with a crossbar.

ADJUSTABLE BRACKET on the other side of the box is quickly raised. Now, with the pipe extension opposite, we have the framework for a boxlike canvas tent that slips over the whole assembly. The varying heights of the crossbars provide a rain-shedding slope to the roof.

ON LOCATION, we thread pipe legs into floor flanges that are attached to the bottom of the big plywood box. One lid half unfolds to form a counter-height work space for cooking, washing and similar camp chores. The high-walled center section becomes a food cupboard.

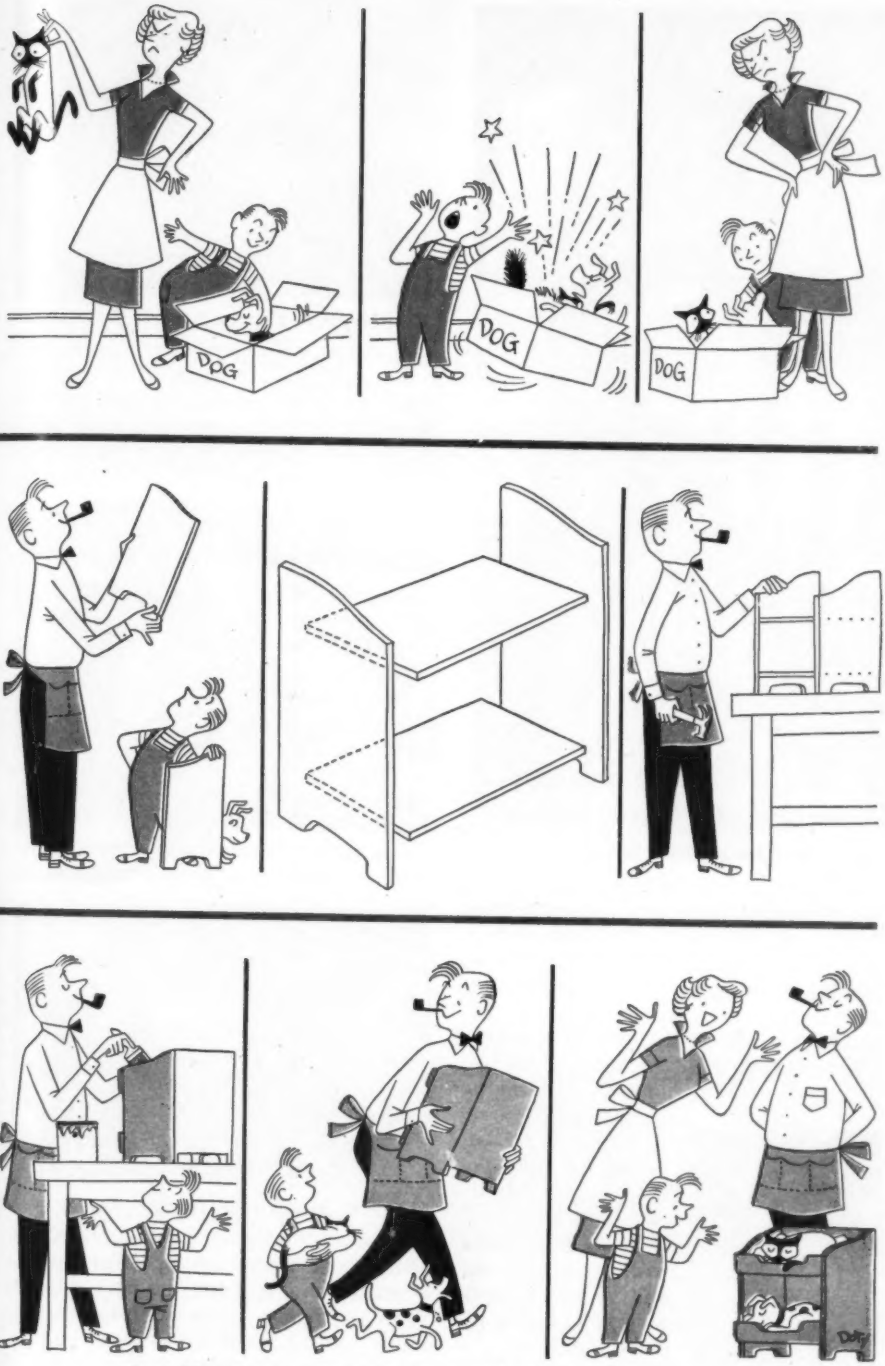
OPPOSITE END OF THE BOX folds out, too, but at a lower level—just right for this four-place picnic table. The box section beyond extends the table area, puts our portable icebox within easy reach, and provides a convenient place for our gasoline lantern when it gets dark.

CAMPING-BOX TENT sleeps three, frees the station wagon for the rest of us to use as night quarters. A friendly awning maker tailored the waterproof duck cover to the box. Snap fasteners batten down the watertight flap; grommets provide holes for the stake-rope connections.

BACK HOME AGAIN, we set the box against a house wall. It rests on a two-by-four frame and is held firm at the top with big hooks and eyes. There, it becomes a storage cabinet—the right size, naturally, to hold our camping gear until we're ready to go on another trip. END

By Roy Doty and Warner G. Tilsher

Wordless Workshop



Next Month: A vegetable bin built into the kitchen counter

Corrugated Plastic Sheet Forms Door for Shower

ONE sheet of corrugated plastic 26″ by 72″ makes a durable, attractive door for a stall shower. The translucent material comes in different colors and is so rigid that you can use it without framing.

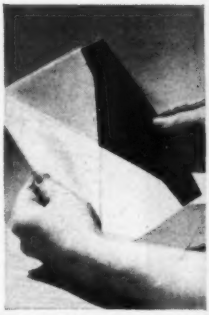
For the average shower opening, 24″ by 68″, trim 2½″ off one end of the plastic sheet. Then cut the sheet in two lengthwise, and mount each piece on the shower frame with two offset cupboard hinges. Fasten the hinges, as at left, 6″ from the top and bottom of the door with aluminum bolts and nuts. The sections will overlap by one corrugation.

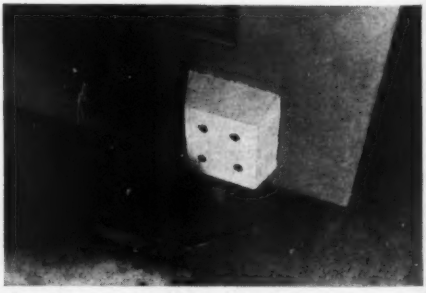
Toothpick Turns Small Screws

A WOODEN toothpick makes a safer adjusting tool than a screwdriver for delicate work on such things as model engines, instruments and certain electronic parts. The flat end of the toothpick fits small screws and breaks before overtightening can cause any damage.

Black Paper Protects Money

IF YOU mail money, it's wise to hide the currency from larcenous eyes. You can make the envelope peek-proof by inserting a piece of heavy black paper, such as the kind that photo materials are wrapped in.





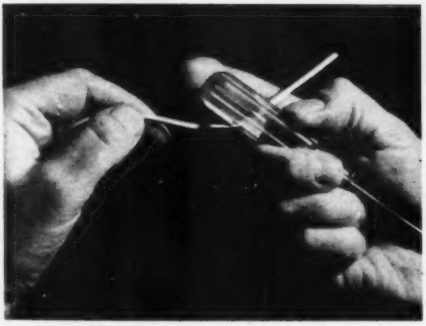
Caster Supports Dutch Door

SOME of the heavy loads imposed on Dutch-door hinges can be transferred to a caster running along the floor. Mount it in a wooden block screwed to the lower outside corner of the door.

New for the Handyman

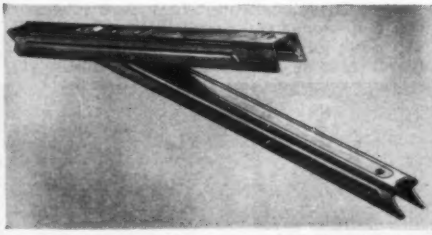
1. Stencils Do Home Lettering. A new series of stencils made especially for the handyman can help you do professional lettering on house markers. The letters come in three type faces and in sizes ranging from ½" to 2½". Guide holes assure proper spacing and alignment.

More information *about the products on this page can be obtained from: 1. Stenso Lettering Co., Industrial Bldg., Baltimore 2; 2. Wire Stripper Tools, Inc., Glen Head, N.Y.; 3. Masonite Corp., 111 W. Washington St., Chicago 2; 4. Taber Bushnell Co., 1112 Metropolitan Bldg., Minneapolis 1.*

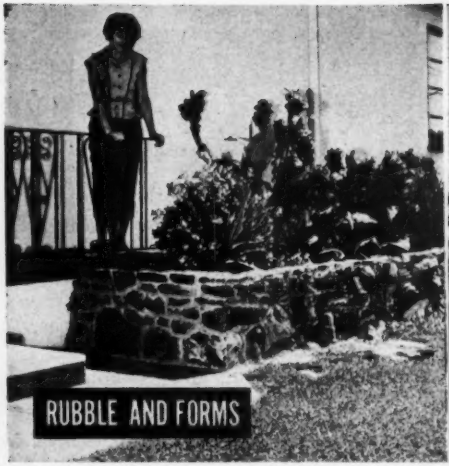


2. Screwdriver Strips Wire. The handle of this screwdriver has a built-in stripper to remove insulation from wire. You just push the end of the wire—from 14 through 20 gauge—into a hole in the handle and pull back at an angle.

3. Parts Jars Push In, Pull Out. These jars for small hardware are designed to be mounted on a perforated-hardboard tool rack. Their tops—with or without caps—slip into brackets which are held by clips that hook in the perforations.



4. Bridging Strips Are Adjustable. Squeaky floors can be silenced by setting these steel bridging strips between joists. Each strip (left) consists of two channels that you adjust to length, then squeeze together to lock into place.



How to Build with Stone

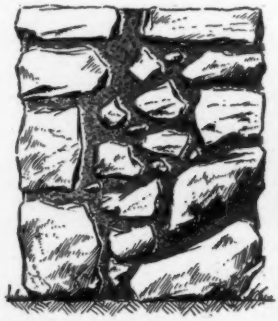
Nature's oldest do-it-yourself material is also one of the handsomest. Here are four ways to use it.

BUILDING with stone and mortar is no ordinary craft. One day you're dabbling with gray powder, sand and water—the next, a bulldozer couldn't budge your handiwork. It's an all but indestructible monument to your skill—or lack of it.

That's why you should know what you're doing when you tackle a stone-masonry job.

The photo sequences that follow cover four time-honored ways of getting attractive results from stone. Choose the right one for your project and, with reasonable care, you'll have a wall or structure to be proud of.—*Paul Corey.*

RANDOM RUBBLE



IN SETTING UP a random rubble wall, footings aren't needed; the stones are simply bedded in mortar laid on level, hard ground (left photo). Use a tape, occasionally, to check wall thickness (right photo). If you plop stones and mortar between the wall faces before they set, don't go higher than two feet at a time. A deeper core of wet cement may collapse the stonework.

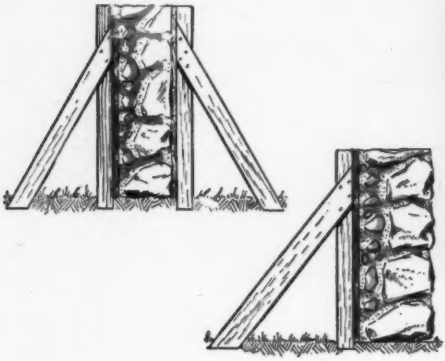
RANDOM-RUBBLE masonry is massive and informal—a "natural" for rustic, free-standing walls.

There's nothing tricky about laying random rubble. All you need is a good eye, a strong back, and a whopping-big supply of mortar and field stones or quarry rubble. (Quarry rubble is the ragged stuff that's left over after stone-cutting operations; you can buy it for about $2 a ton if you load and haul it away from a quarry, yourself.)

To set up your random-rubble wall, you take the biggest stones and trowel them together to form two parallel face sections with a pocket between them. Then you dump more mortar and smaller stones into the pocket, until you've brought the whole wall up to level.

For mortar, use three parts of sand to one part cement, adding just enough water to hold the mix together. For equipment, you can get by with only a metal wheelbarrow to mix the mortar in, a shovel and mason's pointing trowel. Don't use your bare hands to point up mortar. Fingers and wet cement mix too well—the lime can cause painful burns.

RUBBLE AND FORMS

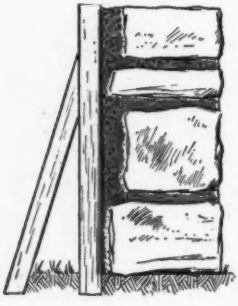


VOLCANIC ROCK WALL is not as massive as you'd think. Old boards, backed by bracing posts, confine mortar behind the facing stones to a fairly narrow area. There's no point in taking time to dress up the back of a retaining wall.

RUBBLE-AND-FORM construction saves stone, mortar and lime. It is made to order for a wall that puts its best face forward. Use it for such projects as retaining walls, mulch enclosures, barbecue pits and plant pockets.

For informal rubble-and-form work, you set up a temporary backing of boards or plywood, nailed to bracing posts, where you want the back of your wall. Then you trowel up a stone face section, just as you would for one side of a ran-

CUT STONE



CUT STONE is adaptable to almost any formal stone project, but takes a bit of careful leveling and fitting. You set the stuff up in one of two ways: When you lay each course with stones of equal height, keeping the horizontal mortar lines continuous, you get what professionals call coursed ashlar. If you lay the stones so that all individual joints are either horizontal or vertical but don't form continuous courses —that's random ashlar.

Cut stone can only be made from rock that has pronounced grain and cleavage, allowing it to be split into layers of varying thickness and broken crosswise into fairly regular shapes. Even then, it takes plenty of know-how to shape it up by hand. Unless you're a semi-pro or a glutton for punishment, buy your cut stone at a quarry.

SHAPE THE FACES of cut stones for curved walls or circular enclosures. Mark the contour on the stone with a grease crayon.

CUSHION THE STONE on a thick bed of sand while you chip off excess material with bias hammer blows. Any hammer will do.

TO SPLIT A STONE, score it along the line of the grain. Then lay it on a board and give it a light tap, as shown.

FORM WAS USED ON THE FACE SIDE of this wall. Bedded in mortar, stones were pressed, flat face forward, against the form boards. With the form removed, mortar that oozed out between the boards is being chipped away.

POINTING UP THE CRACKS between stones with grout (a two-parts-sand, one-part-cement mix), makes a wall face that was laid against forms look like a cut-stone job. A small mortar board takes the messiness out of pointing.

dom-rubble wall. Finally, you backfill the shallow space between the face wall and the form with mortar and stones.

You can also use forms with rubble to get a cut-stone-facing effect. Here, you build between two forms, raising the forward form a few boards at a time as you stack facing stones and mortar against it.

Because they are relatively thin, all rubble-and-form walls should be based below frost line. If the wall is very thin, base it on a broad footing.

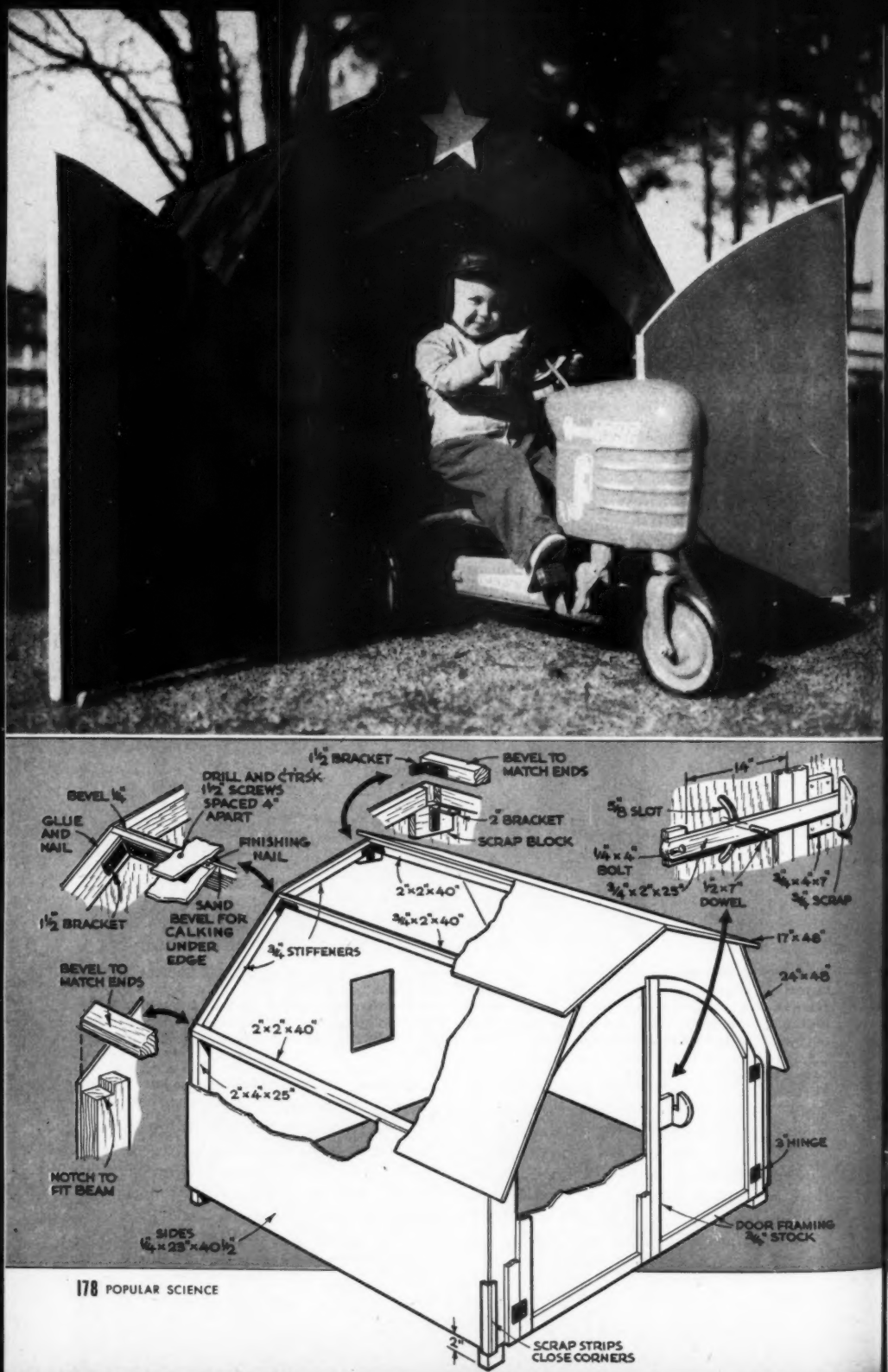
STONE VENEER

WALL TO BE VENEERED was covered with heavy, tarred building paper, over which 1"-mesh chicken wire was stapled. Stone slabs were buttered with grout, then pressed in place and anchored with galvanized roofing nails. When you point up the cracks, cover the nail heads (left photo). Unless you are a jigsaw expert, you'll either have to lap the wall top with a wide wood molding, or cut slabs to size with abrasive wheel chucked in a power saw (right photo).

STONE VENEER is the easiest way to give an inside or outside house wall that "solid look." A quarry that supplies cut stone usually carries veneer slabs. These come in irregular shapes ½" to 1" thick. A ton of cut stone will cover approximately 240 square feet of wall and, with the mortar, will weigh between 10 and 12 pounds to the square foot.

If you plan to cover an inside wall with cut stone, make sure that you have the underpinnings to support this weight. The backing frame should have studding spaced on 16" centers, covered with wood sheathing anchored at 2" intervals with eight-penny nails.

Stone veneer goes up fast. The photos show you how to handle it.


1½" BRACKET
BEVEL TO MATCH ENDS
DRILL AND CTRSK 1½ SCREWS SPACED 4" APART
BEVEL ¼"
GLUE AND NAIL
FINISHING NAIL
2" BRACKET
SCRAP BLOCK
14"
⅝" SLOT
¼" x 4" BOLT
¾" x 2" x 25"
½" x 7" DOWEL
¾" x 4" x 7" SCRAP
1½" BRACKET
SAND BEVEL FOR CALKING UNDER EDGE
2"x2"x40"
¾" x 2" x 40"
¾" STIFFENERS
17" x 48"
24" x 48"
BEVEL TO MATCH ENDS
2"x2"x40"
2"x4"x25"
3" HINGE
NOTCH TO FIT BEAM
SIDES ¼ x 23" x 40½"
DOOR FRAMING ¾" STOCK
2"
SCRAP STRIPS CLOSE CORNERS

Toy Barn Shelters Toy Tractor

By Walter M. Hoke

I'M NOT sure which birthday present three-year-old Steven likes more—his shiny new toy tractor or the miniature barn I built to house it. The barn not only protects the expensive toy, but also finds steady use as a hangout for riders of the neighborhood range.

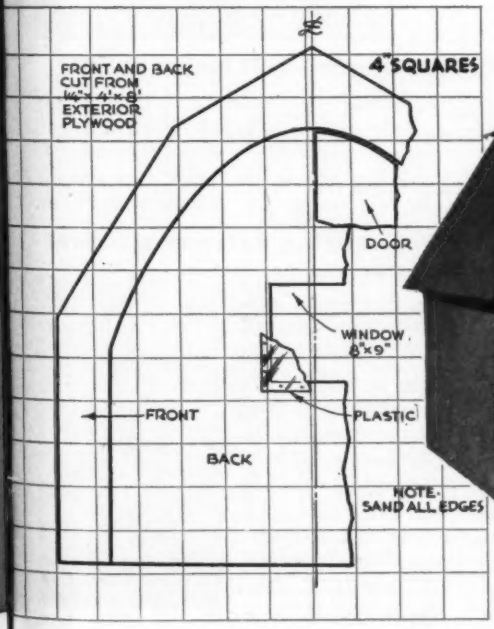
The barn covers 13⅓ sq. ft., ample for a big-wheeled toy or several small ones. It uses the lawn for a floor. The two-by-four corner posts rest on bricks laid in the ground and raise the sides about 2″ to provide ventilation and prevent dampness. The job took two weekends and required about $15 worth of materials.

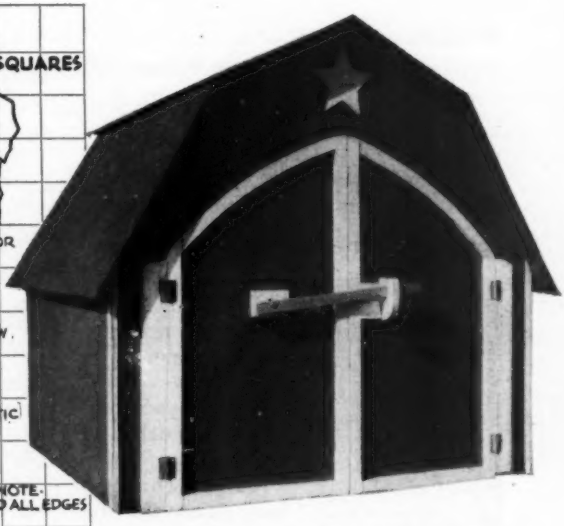
The roof, sides, ends and doors are ¼″ exterior plywood stiffened with ¾″ solid stock. Doors are simply sawed out of the panel that makes the front end. Roof pieces are 48″ long to allow overhang.

You'll need help when you assemble the parts. Stand the ends up and clamp the ridgepole in place while you screw the angle brackets to the ends. Then attach the sides to give rigidity, and install the other roof beams. Put on the lower roof sections first, then the upper ones, sealing joints with calking.

The barn is painted red, naturally, with white trim. Spar varnish seals the inside, and roofing compound is brushed over the roof. Plastic film makes good glazing for the window, since it won't break easily and is not dangerous if it does break. Tack this on last, since the window opening makes a hand-hold that you will need when moving the structure into place.

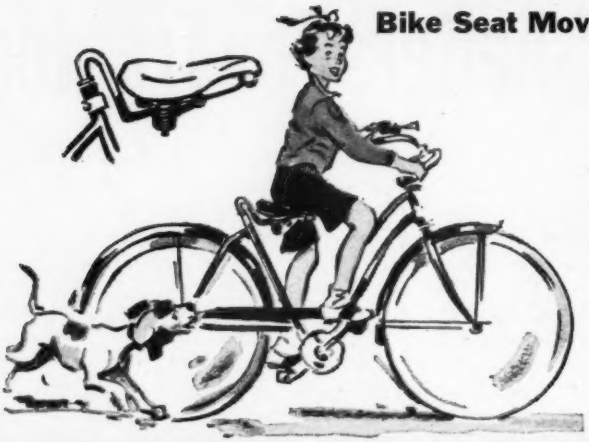
The final touch is a white-painted star, like the decorations that some Pennsylvania folk use on their barns. I cut it from a plywood scrap.



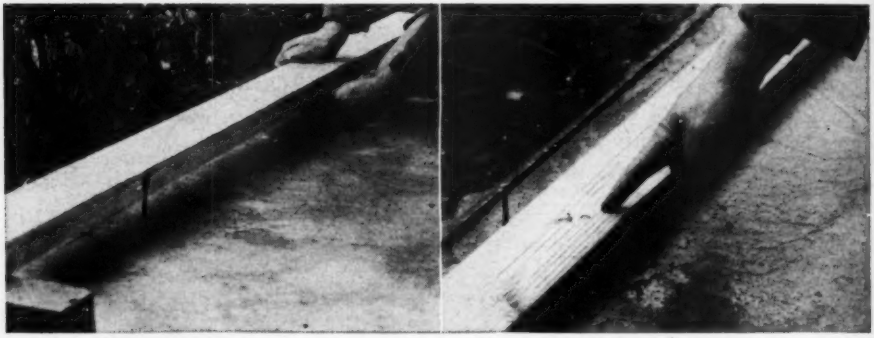


SIMPLE LOCK that a toddler can handle without frustration is a must. This one is a swinging bar, but a sliding bolt would also do. Make sure that it operates easily from inside, too.

Bike Seat Moves Closer to Pedals



THIS modified seat post makes it possible for a small child to reach the pedals of big sister's bicycle. Simply replace the original seat post with a length of ⅝" steel bar having the extra hairpin bend shown. A local welding shop will usually make the bend. When the child grows, you can easily switch back to the regular seat post.—*A. R. Tanner Jr., Poughkeepsie, N. Y.*



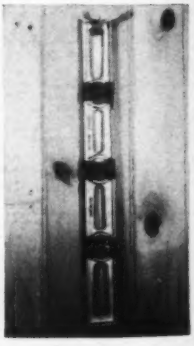
Tubing Marker Shows Where to Bore Anchor-Bolt Holes in Sill

WHEN you have to lay wall sills over bolts set in a foundation, a piece of plastic tubing the same diameter as the bolts helps spot holes accurately. Position the timbers over the bolts by resting them on bricks. Split the tubing in half and dip an end in graphite. Then slide it around each bolt, pressing upward, to mark a circle on the bottom of the sill. —*W. G. Waggoner, Sacramento, Calif.*

Small Magnet Holds Fishhooks

FISHHOOKS and flies will always be within easy reach for quick changes if you stick them on the outside of your fishing-shirt pocket. I hold mine there without tearing holes in my shirt by keeping a dime-store magnet or two in the pocket.—*Fred M. Pease, El Paso, Tex.*

Inner Tubing Safeguards Level



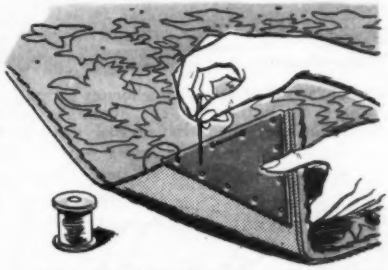
THICK rubber bands slipped over the spirit glasses in your level when you store it will keep a glass from being broken accidentally. You can cut the rubber bands from an old inner tube (bicycle-tube bands make the best fit). —*Victor H. Lamoy, Upper Jay, N. Y.*

Keeping the Home Shipshape

A SANDBOX ON STILTS fixed to a house or garage wall lets castle builders sit on a warm, dry seat. Add a hinged cover, and the box can be closed up to serve as a play table. The cover hooks to the wall when lifted.

METAL LAWN CHAIRS with contour-shaped seats often collect little puddles when it rains. If a hole is drilled in the center of the seat toward the back, where the slope is deepest, water drains through the hole and the chair dries faster.

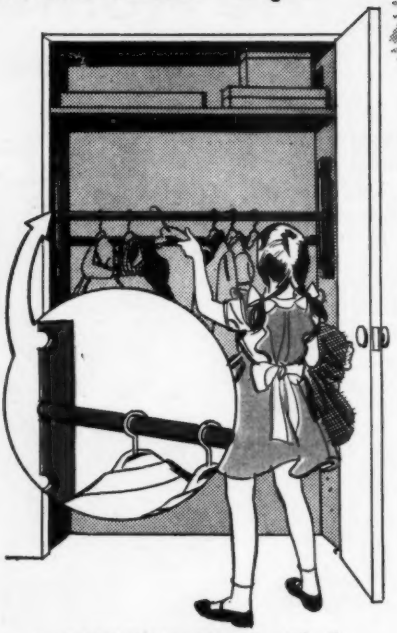
A BLANKET-STORAGE SAFE can be built around a closet shelf that is too high to reach for everyday items. Hang tight-fitting doors from shelf to ceiling and seal the crack between the shelf and wall with masking tape to make the storage area airtight.



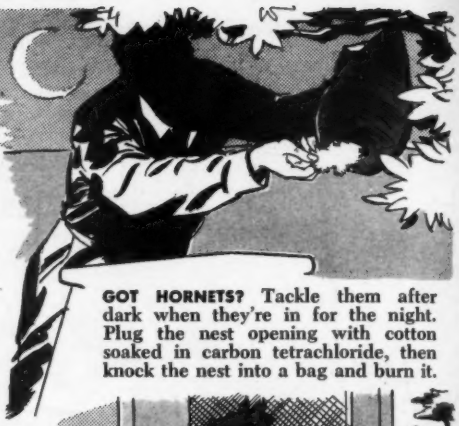
LIGHT SUMMER RUGS of cotton or fiber won't curl up at the corners if they are stiffened with triangles cut from linoleum or floor tile. Punch holes around the edges of the triangles with an awl, and then sew them to the rug with heavy upholstery or button thread.

Please turn the page for more home tips

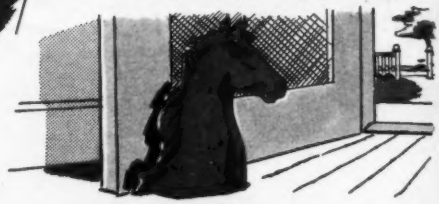
More Home Tips



A CLOSET THAT GROWS with the child makes it a lot easier for a youngster to keep the room tidy. Notched 1"-by-2" strips on the closet walls let you raise the hanger bar as the child grows taller.



GOT HORNETS? Tackle them after dark when they're in for the night. Plug the nest opening with cotton soaked in carbon tetrachloride, then knock the nest into a bag and burn it.

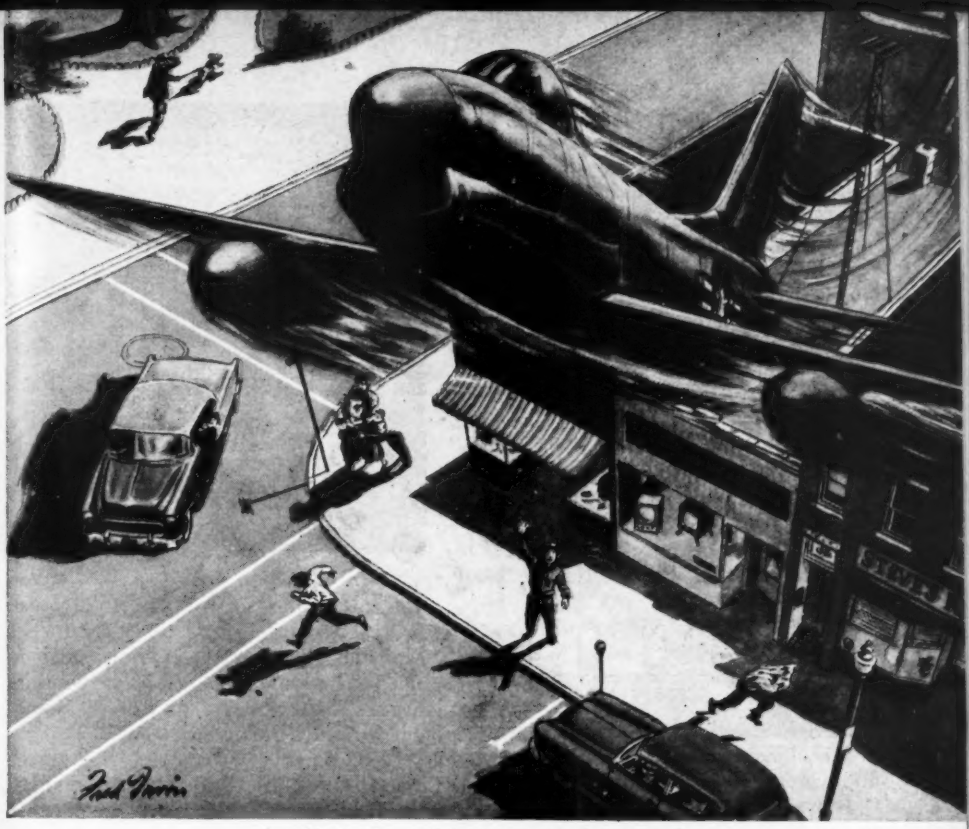


A HEAVY BOOK END has many uses. It will keep a door from slamming, wedge up a window with a broken cord or weight down newspapers outdoors.

CHEAPEST KINDLING for barbecues is tightly rolled newspapers. Soak these "logs" overnight in water, wring hard, and let them lie several days until bone dry.

STUFF THE HOLE IN A SPOOL with a wad of cotton and you make a safe place to store the needle. With the point sheathed instead of jabbed through coils of thread, a seamstress can search through a sewing basket full of spools without danger of pricking a finger.

CROQUET WICKETS won't trip the unwary if you dress them up to advertise their presence. Try wrapping them with the brightly colored plastic coils that keep telephone cords free of kinks. Or slip-cover them with the colored spaghetti tubing that radiomen use to identify various wires.



"I had a wild vision of the pilot buzzing my shop."

Why Tubes Play Dead in TV Circuits

By Art Margolis

BEING a TV serviceman, I've learned the hard way that a tube out cold is not necessarily deceased. Tubes that just play dead are usually a sign that something else is wrong. Take the time I answered an SOS from a jet pilot.

This was no emergency, but a service call from a pilot who lives in a trailer camp near his base. He'd called a couple of times the day before, but I'd been busy. In fact, I almost forgot about him.

I remembered him with a sense of shock when I heard the roar of a jet plane overhead. It got louder and louder. For a moment I had a wild vision of the pilot buzzing my shop to get me to work on his set. It turned out to be just a passing plane, but I drove out to that trailer camp quick.

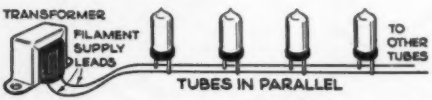
There was light on his screen but no sound or video. I thought I'd located the trouble when I found a 6J6 local

oscillator tube stone cold, but the pilot said no. It was a brand-new one he'd put in after finding the original one dead. Since this one didn't light either, he'd called me.

In this set, the tube filaments were in parallel; two wires from the transformer were strung along all the sockets, and the tubes connected across them like rungs in a ladder. Even if you take one tube out of such a hookup, the rest will stay lit, so all were bright but this 6J6.

It checked okay, as a new tube should. But poking around inside the set, I found a clip broken in the tube socket. Filament current just wasn't getting to the tube.

Sockets are cheap, but this one was in the tuner section. Because of the labor



involved, installing a new socket in this would have cost more than replacing the whole tuner, which is what I did.

It was still an expensive job—but at least I could give him credit on my bill for that new tube that he didn't need.

The Case of the Store Dick's Eye

ANSWERING an emergency call from a local department store, I was met by a hefty store detective. Up in his office, he showed me a 16-incher. This, he informed me, was not for looking at "Dragnet." It was the monitor for several closed-circuit TV cameras spotted through the store to watch out for dirty work. The detective was frantic. A skinny little shoplifter was in Men's Furnishings, under scrutiny of a TV eye. But the monitor had conked out. Would I fix it quick?

It looked easy, for I found a 6BY5 dead. With a flourish I whipped out a new one, winked, and put it in.

It didn't light either.

Sobered, I yanked it out and tried another new one. It also stayed dead. There was nothing to do but pull the

chassis. Doing so, I found the worst.

A 6BY5 tube needs 6.3 volts for its filaments. The big power transformer in this set had one special 6.3-volt winding just to light up the 6BY5. But somewhere inside, this winding was open.

Most times you'd replace the power transformer. But with the little shoplifter at work, time was precious. I hastily installed a separate little 6.3-volt filament transformer and connected its output leads to the 6BY5.

This time it glowed, and Men's Furnishings appeared on the screen. But there was no skinny little fellow in sight.

Instead, a fat little guy in one corner was putting on more weight all the time. Slinking from rack to rack, he was squirming into one piece of clothing after another.

My detective customer rushed from the office. I sat back to watch a real-life TV drama unfold. The fat little man rapidly got his figure back. They peeled five overcoats and three suits off him.

Whitewashing a White Elephant

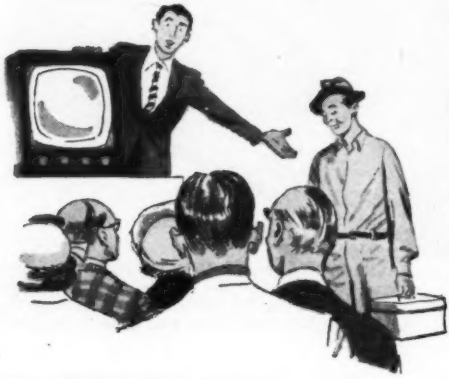
ONE spring morning, on my knees in a church basement, I found myself in real trouble. Outside, a big crowd was attending a white-elephant auction. The big attraction was a 16-inch TV set some kind soul had donated. Unfortunately it

didn't work. So my wife had donated me.

With extension cords and rabbit ears I got juice and signal to the set. But not a tube lit. Checking them one by one, I found that all were perfectly good.

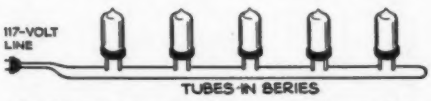
But in this set the tubes were in series, like the smaller kind of Christmas-tree lights. In such a setup, there is no transformer. The tubes are hooked up like links in a chain, and the 117-volt juice goes in one end and out the other.

When it first hits such a chain of



tubes, their cold filaments have low electrical resistance and let a wallop of current through. For half a minute the tubes take a terrific beating. As the filaments get hot, their resistance goes up and current drops down to normal.

To protect the tubes, series strings have a special resistor linked into them. Its resistance is high when cold, low when hot. So it holds juice back until



TUBES IN SERIES

the filaments can take care of themselves.

There on the church floor, I found that the protective resistor had opened inside, breaking the entire filament circuit. I just managed to install a new one before the auctioneer came for the set.

When he loudly announced a 16-inch TV "donated by John Carson and put in fine working order by Art Margolis" I felt that I'd been well paid.

A Special in Tombstones

TV SETS turn up in the unlikeliest places. One call took me to a tombstone maker. He had a 17-inch set that he liked to keep going while he chiseled out epitaphs.

But today the set had no sound, picture or brightness. The filament circuit was a series string, but all the tubes were out cold—except two.

These burned brightly.

All the cold tubes checked out fine, even though they didn't work in the set. It was when I checked the two tubes that lit that I found the culprit.

One of them, a 5J6, had developed a filament-to-cathode short. Since it was the second tube in the string, and the cathode goes to ground, the 117-volt juice was being siphoned off before it ever reached the other tubes. A tube that lit was killing off all the rest!

Putting in a new 5J6 restored all the tubes to life and set the tombstone maker chiseling away to music again.

"Say, how about letting me chisel you out of your bill?" he wisecracked. "I'll make you up a nice little stone in payment for the job."

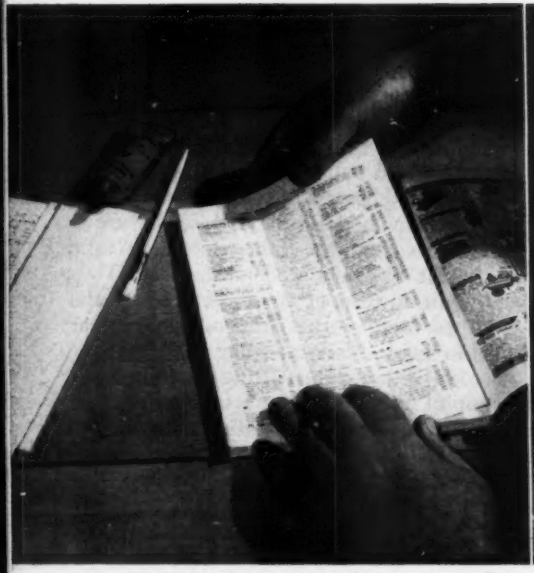
"Okay," I responded solemnly. "But I'll have to have it right away."

It almost made him drop his hammer.

"Just finished a swank cocktail table for my wife," I went on. "For the top, you can whack me out a nice kidney-shaped piece of black marble." END

Simple Steps

EACH HANDSOME VOLUME holds six issues. When opened flat the pages stay put, won't come loose from the binding. Cut the large title from an old PSM cover and glue it in place.



1 CUT INDEX SHEETS out of this issue and glue them to last page of last magazine in each volume. Attach sheets along ⅛" of their inner margin, lining up outer edges with pages.

2 SANDWICH SIX ISSUES between cardboards that are narrower and longer than magazines. Sand backs lengthwise to free individual pages. Sand sides more, to round the back.

Bind PSMs into a Book

By Kenneth Murray

THE past year's issues of POPULAR SCIENCE MONTHLY are crammed with informative how-to-do-it features and workshop tips that you'll want to refer to often. The best way to keep them handy is to bind the magazines into permanent volumes of six issues each. And right now is a perfect time for the binding job because this issue contains a complete index of workshop articles. The index, one for each volume, follows these pages.

You can turn out a binding job of professional quality yourself. It's simple and fun. The materials cost only a few dollars and you'll have plenty left.

You'll need specialized materials: bookcloth, a smooth, sized fabric; super, a starched, open-mesh cloth also called buckram; and heading, a narrow strip of soft cotton with one thick, colored edge. Bookcloth covers the outside of your volume, while super and heading are glued to the back before you put the covers on. Library-supply houses* stock these items. Plastic glue, twine, cardboard, and white and colored paper can also be ordered from the library-supply firms if you don't have them.

Bookcloth and super come in minimum amounts of a square yard—enough to bind 36 issues of PSM. On these pages and the following three, you'll find how to do the job.

**Library Service, Bro-Dart Industries, 59 E. Alpine, Newark 5, N.J.; Demco Library Supplies, 2120 Fordem Ave., Madison, Wis.; Gaylord Bros., Gifford & Granger Sts., Syracuse, N.Y.*

3 GENTLY TAP THE BACKS to spread the edges outwards about 3/16" on each side, after dampening the edges with a moist sponge. This completes the job of fitting the back for covers.

4 LAY LENGTHS OF TWINE into narrow grooves in back. These are sawed about 3/16" deep every ½", and brushed with glue. Glued-in twine helps hold back together. Trim twine flush.

5 **HEADING STRIP** provides colored edges at both ends of the back. It is applied after the entire back has been brushed heavily with glue, allowed to dry, and sanded smooth.

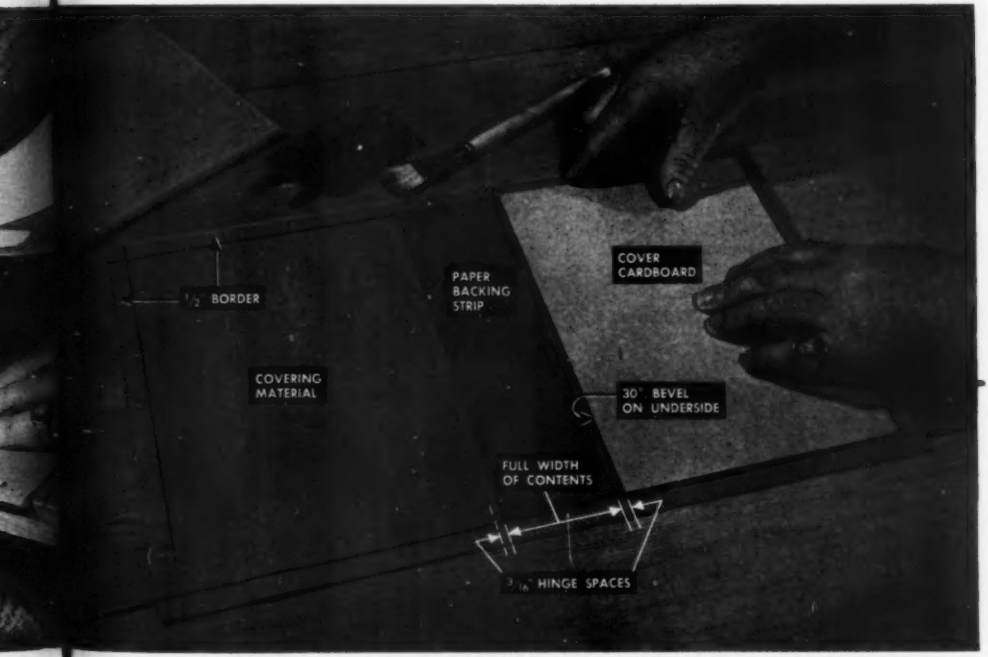
6 **CENTER A PIECE OF SUPER** over back, ½" short at each end, with a 1" overlap at sides. Press firmly into glue. Then remove cardboards, fold down overlap and replace cardboards.

9 **TRIM TWO CARDBOARD COVERS** to size. A paper cutter does the best job, but a knife or razor will do almost as well. Make cardboards 3/8" longer and 1/8" wider than the contents.

10 **ROUND ALL EDGES** of the cardboards with sandpaper. Sand a 30° bevel on one surface of one long edge. This will make hinges of book work more easily later, when cover is on.

7 **GLUE A STRIP** of heavy colored paper the size of the back over the super. But don't let the ends of the paper cover the projecting edges of the heading at each end of the back.

8 **TURN CONTENTS OVER** and lightly sand front edges of magazines smooth. For a slightly concave profile, use a rounded sanding block and bear down hardest on the middle section.



11 **LAY OUT A SHEET** of covering material with a strip of colored paper backing and the two cardboards. Allow for margins and spaces indicated and glue backing strip and cardboards to material. Backing strip is same size as one previously glued to back of contents. Cardboards are placed with the beveled edges adjacent to the backing strip, bevel down.

Please turn the page for more about bookbinding

12 SNIP BOOKCLOTH CORNERS diagonally to within 3/16" of the cardboard, to avoid extra thickness. Then glue down the overlapping edges of the covering material onto the cardboard covers and the backing strip.

13 GLUE SUPER TO COVER BOARDS after centering the back of the contents over the backing strip. Centering is best done with the cover spread out flat. Put wax paper under the super while you are gluing it.

14 GENTLY CREASE THE HINGES with a spoon or a letter opener after both the covers are on. The back cover goes on like the front one, with the volume turned over. Pull the second cover on tight against the back.

15 FIT END PAPERS on the front and back. Coat the inside of the cover with glue and insert a folded sheet of heavy paper just twice the page size, so that the outer edges are flush. Then close the cover firmly.

16 SET HINGE CREASES right after fitting end papers. Press heavy wire into creases with wood strips and rubber bands, protecting bottom of volume with cardboard. Leave overnight.

17 FINISHING TOUCH is small label on spine, big one on the front. Cut small one from top of a contents page (p. 2) and glue on. A coat of clear nail polish will protect it. END

POPULAR SCIENCE MONTHLY

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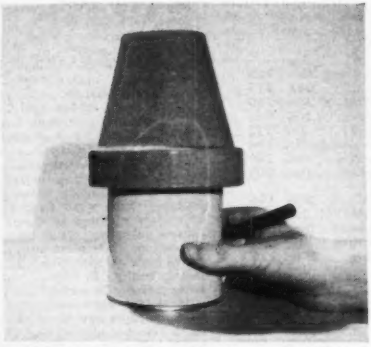
Asbestos Soldering Pad Keeps Bench Top Free of Burns

AN ASBESTOS siding shingle makes a burn-proof pad to protect your workbench from your soldering iron. If you want to fasten soldering pad permanently to the bench, use shingle nails.—*Carl H. Hubachek, East Haven, Conn.*

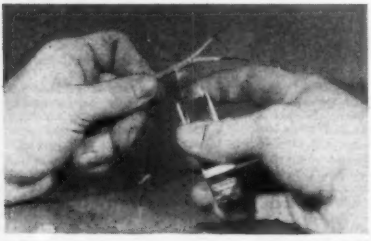
▶▶▶ A new hammer handle won't work loose if you shrink out moisture. Drive the handle in and put the tool in a warm, dry place for a few days. Repeat the drying-driving process until the handle won't go further. Saw off excess, and drive in wedges.

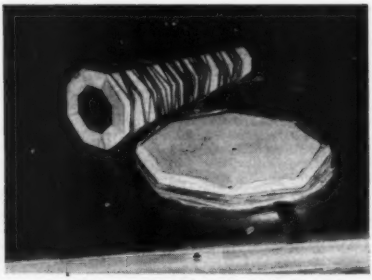
DO IT THE EASY WAY



PAINTING A FLOWERPOT is simpler if you invert it over a tin can. You can turn the can as you work, and it holds the pot off the bench while the paint dries.

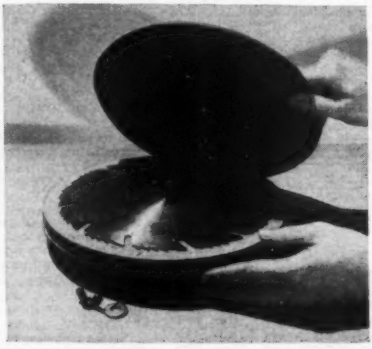
LAMP CORD COVERING won't unravel where it enters the plug if you wrap the end with cellulose tape. The cord will wear longer, too, at this spot.





TO CLAMP ODD SHAPES after gluing, wrap them with long lengths of model-plane rubber or strips of light inner tubing.

TO STORE SAW BLADES, sandwich them in oversized hardboard disks, drilled at center to take a bolt and wing nut.



POPULAR SCIENCE MONTHLY

Mechanics and Homebuilding

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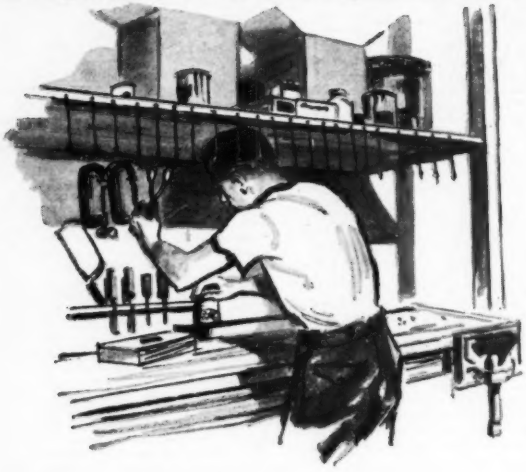
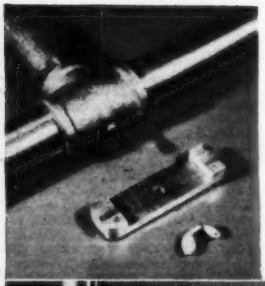
Dangling Cord Warns Against Conking Head on Low Shelf

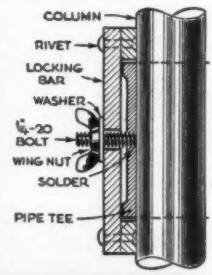


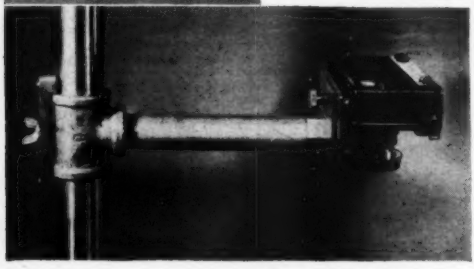
IF SPACE is a problem and you have to build your workbench under a shelf that doesn't give quite enough headroom, you can save bumps by putting up a ducking signal. Pieces of heavy cord or a length of fringe tacked to the shelf edge will warn you to keep your head down for safe clearance.

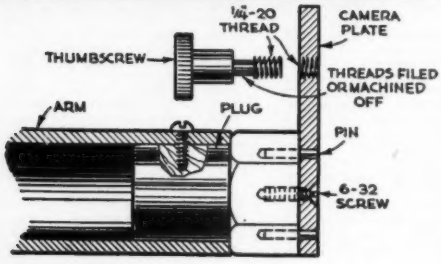
▶▶▶A curved windshield really dresses up a powerboat. You may find one in the junk heap of an auto-glass shop. Often, slightly damaged windshields are discarded for new ones to comply with auto-vehicle laws.

Pipe Fittings Make Sliding Arm for Shop Tools or Photo Gear









AN ARM adjustable to various heights on a vertical column can be a valuable stand for photographic or shop equipment such as an enlarger, copying camera or bench drill. The one shown here was made from ordinary pipe fittings.

You will need a tee that can be reamed to a smooth-sliding fit for the column. The side opening should take a length of ¾" pipe which serves as the arm.

Drill and tap the tee opposite this opening for a ¼"-20 bolt about 1" long. Cut off the bolt head, screw the head end into the tee (but not so far in that it protrudes on the inside), and solder it in place.

Then make a locking bar from ¼" metal or hardwood, as shown in the top drawing, with cleats of the same stock riveted to the ends. Pressure on the wing nut will lock the arm in place on the column.

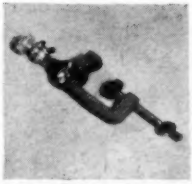
The mount on the end of the arm is pinned and screwed to a plug which is secured to the pipe by a screw (left). This mount is for photo copy work—minor changes would adapt it to other equipment.

NOW YOU CAN GET PICTURES YOU COULD NEVER GET BEFORE!

KODAK PHOTO AIDS

Here are 8 ways to add to your summer photo fun

Filters for realism—You can use filters to accent clouds, cut down haze, improve tonal values. And here's the easy, low-cost way to buy them. A selection of top-popular filters, "custom-tailored" to your camera in a handy "swing-out" *Kodak Filter Kit* costs as little as $6.

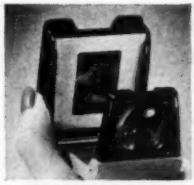


S-t-e-a-d-y does it! All the steadiness of a tripod with none of the bulk or bother . . . and at a fraction of the cost. *Kodak Flexiclamp* fits most camera models, clamps securely to anything from a chair back to a garden fence. (Fine for holding extension flash units, too.) $5.95.

Tip-top flash unit—Top efficiency and economy—*both* in this new pocket-size flasholder by Kodak. The *Kodalite Super-M* is battery-condenser powered for long life, efficient illumination . . . is designed for peak results with low-cost M-2 bulbs. Fits most flash cameras. $9.95.

Don't be a "forgotten man"! Get into the family snapshots yourself by using a *Kodak Auto Release.* Fits any camera having a cable release socket, gives you up to 10 seconds to move into your picture scene and get set for the shutter click. Only $3.86.

Protection . . . plus—Protect your camera and, at the same time, provide yourself with extra picture-taking convenience. *Kodak Field Cases* afford full protection, yet their hinged-front design keeps you set to shoot. From $2.65.



Show color slides any time, anywhere! Just slip a slide in your *Kodaslide Pocket Viewer,* point it toward the light, and view the image 4-times enlarged. Folds to less than an inch thick for convenient carrying. Only $1.95.

Print snaps any time, anywhere—Even the kids can develop negatives and make prints with an easy-does-it *Kodak Photo-Hobby Outfit.* Great to take along on vacation—see your pictures quicker . . . and it's fine "rainy-day" diversion, too. From $9.95 complete.

Kodaslide Dial-Lite Viewer—plugs into any house circuit. Brightness control knob dims or brightens light to suit subject being viewed. Adjustable lens. Complete with desk tray for holding slides and viewer, $12.95.

Prices are list, include Federal Tax, and subject to change without notice

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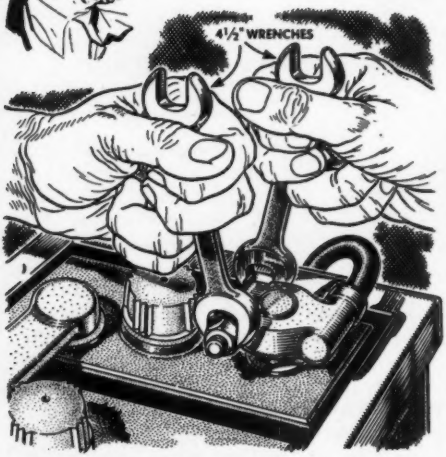
Kodak
TRADEMARK

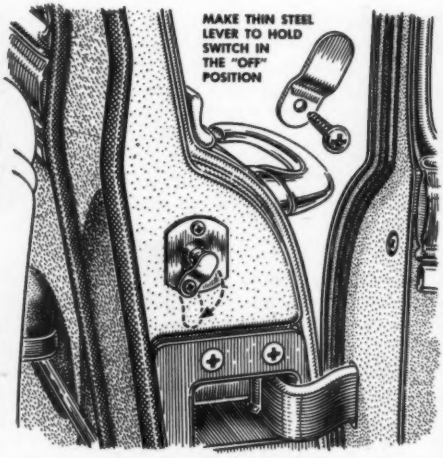
Hints from the Model Garage



Use two wrenches to tighten a battery-cable clamp, pushing with equal force in opposite directions. Then you aren't so likely to loosen the lead binding post and damage the battery cell beneath.

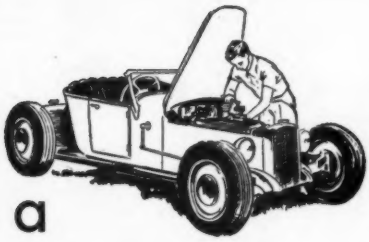
Squeezing a new car into an old garage just about requires wall bumpers. Among the best are sections cut from an old tire. Notch them at each end so that they can be nailed over the studs.

Protect your eyes from falling dirt and dripping grease and oil by wearing goggles when you're working underneath a car. Swimming goggles will do the job nicely and are generally available for less than a dollar a pair.



Want interior lights off—with doors open? You can get around the automatic door switches by fastening little levers, bent from thin steel, under the switch-mounting screws. Just flip the levers up when you want to hold the switches off.

 Please turn to page 202 for more auto hints



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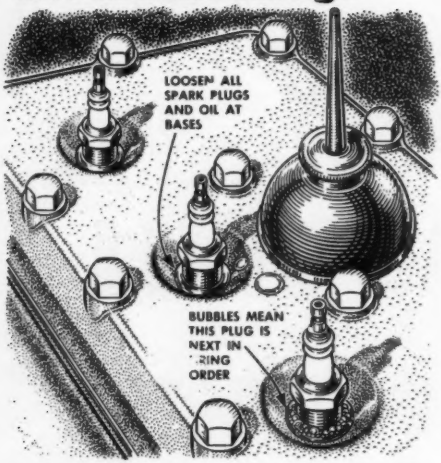
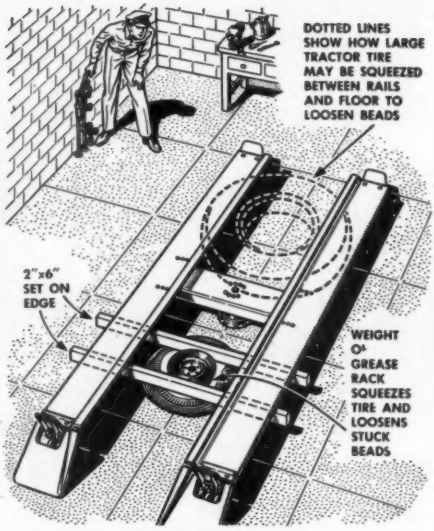
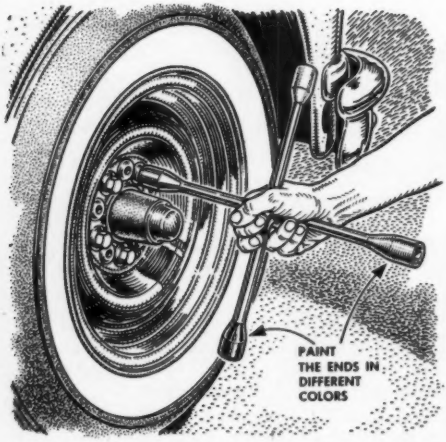
More Hints from the Model Garage



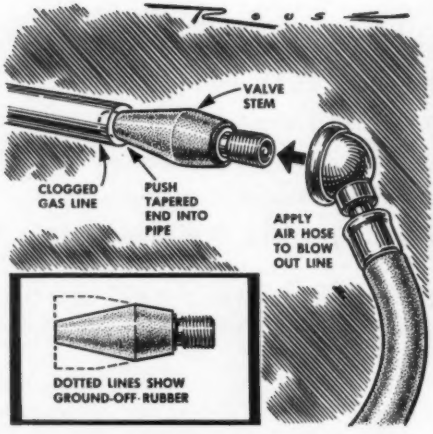
Bubbles in oil reveal the firing order of the cylinders when you have to check the timing of a strange engine. Loosen the spark plugs, squirt a little oil into the spark-plug wells, and then crank the engine slowly while you watch the order in which bubbles appear in the oil.


DOTTED LINES SHOW HOW LARGE TRACTOR TIRE MAY BE SQUEEZED BETWEEN RAILS AND FLOOR TO LOOSEN BEADS
2"x6" SET ON EDGE
WEIGHT OF GREASE RACK SQUEEZES TIRE AND LOOSENS STUCK BEADS

Tightly stuck tire beads are broken effortlessly by one garageman—he lowers the grease rack on them. For most tires, a pair of hardwood two-by-sixes six feet long are placed edgewise across the tire next to the rim. For big tires that just span the rack, no spacers are needed.



Paint each end of an X-type lug wrench a different color and you'll save all that time that you once wasted looking for the end with the right socket. Just remember the right color for the job you are working on at the moment.


VALVE STEM
CLOGGED GAS LINE
PUSH TAPERED END INTO PIPE
APPLY AIR HOSE TO BLOW OUT LINE
DOTTED LINES SHOW GROUND-OFF RUBBER

To blow out tubing easily, make yourself a quick-connect adapter that fits the compressed-air hose to lines of almost any size. The adapter is simply a valve stem from an old tire tube with its end ground to a taper as shown in the inset.

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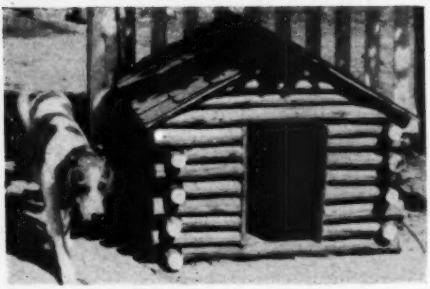
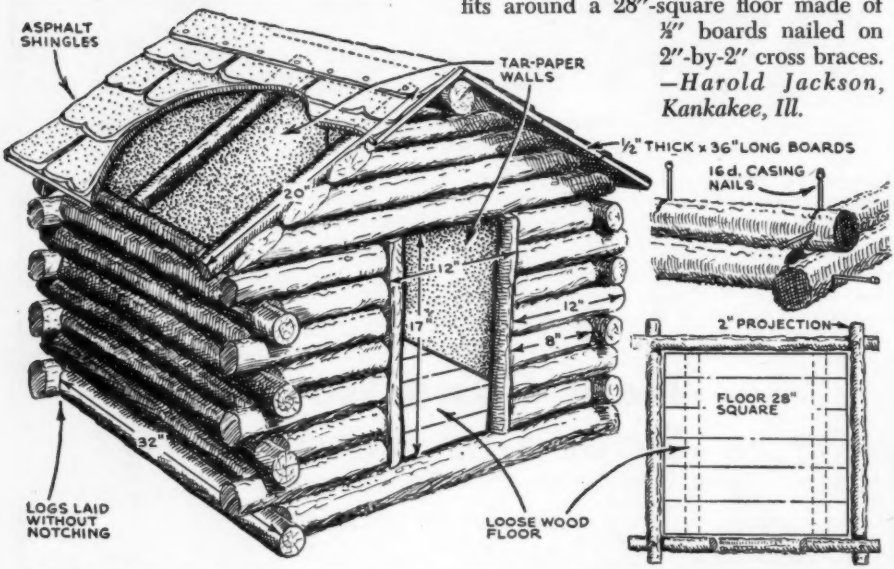
NOTE: In some areas of the U.S., Hawaii, Alaska, and Mexico, prices slightly higher. Western Auto Associate Dealers own their stores, set their own prices, terms and conditions. (PS-7E)

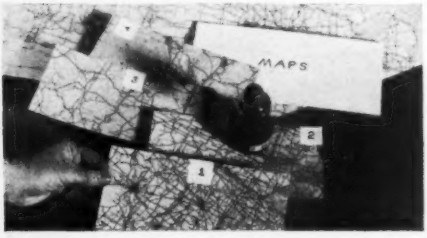
Log Cabin for Pooch Lifts Off Its Floor for Easy Cleaning



THIS rustic doghouse was made from 18 cedar posts laid up like logs. Posts about 2″ in diameter were sawed into 32″ lengths for the sides and back, 8″ and 12″ lengths for the front. The posts were nailed up without notching and the inside walls were lined with tar paper.

Gable pieces were beveled to take ½″ roofing boards, which were laid on six rafters butt-nailed to a ridgepole, and topped with asphalt shingles. The house fits around a 28″-square floor made of ½″ boards nailed on 2″-by-2″ cross braces. *—Harold Jackson, Kankakee, Ill.*





Cut-up Map Is Easier to Read

PLANNING a trip? Easy-to-handle map sections will show you the way with less bother than a cumbersome map. Cut out the parts which show the route you will follow and paste them on cardboard; number in the sequence you will use them.—*C. C. Cooley, New Buffalo, Mich.*

Check List Reminds Fisherman

YOU won't be likely to forget needed fishing gear if you keep a check list taped to the underside of your tackle-box lid. It will allow an inventory of the contents before you take off on a trip.

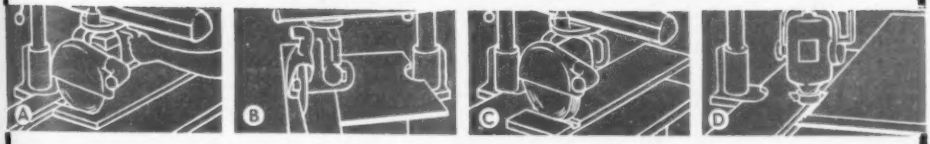
▶▶▶Paper towels in the home workshop are useful for cleaning off your hands, tools or machine parts. Keep them within easy reach on a dime-store plastic holder mounted on the shop wall.

AMF DeWalt® POWER SHOP

makes a wall desk

in one evening

does <u>everything</u>—easier, finer, safer



Simply draw saw across boards to cut to size. See your mark *and* your cut, A. Turn motor and taper-rip both side boards at once, B. Mount dado head and groove where required, C. Shaper head molds desk edge, D. And you have a smart wall desk, ready to erect!

Your big-capacity, easy-to-use DeWalt is 12 professional power tools in one—*a complete home workshop.* And it builds into workbench—uses 75% less floor space than ordinary table saws! Arm raises, lowers, swings 360°... motor and saw ride on arm, rotate 360°, tilt past 90°. DeWalt saws, sands, routs, shapes, grinds, drills, dadoes, surfaces, even cuts aluminum... converts to a lathe, saber saw, belt sander... *pays for itself many times over!*

MB-F above—¾ hp DeWalt-built motor, U.L. & C.S.A. Approved, 9" blade cuts 2½" deep, rips 24" wide... *just $239 delivered.* Professional size GW-I—1½ hp motor, 10" blade cuts 3" deep, rips 26" wide... $395.

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Paint It the Easy Way —Dunk It

HORIZONTAL TANK, made by soldering caps over the ends of a piece of galvanized eaves trough, also serves well for dipping long parts. Use it in place protected from wind and dust. String stretched between nails (right) props up the pieces for drying.

VERTICAL TANK is best for dipping pickets and other narrow strips because little paint is exposed to the air and dirt. This tank is a section of downspout, with a tin-can bottom soldered to one end (above). The spout is tied with wire to a length of pipe which is set in a floor flange screwed to a scrap-wood base. The picket being dipped (left) is impaled on an awl point. Allow parts to drain into the tank for a minute or so after dipping.

YOU CAN borrow a trick from industry that will save time and fuss on many painting jobs. Instead of using a brush, try dip painting.

Manufacturers paint more products by the dip-tank method than by any other except spraying. It's fast and thorough. Objects to be painted are simply dunked in a tank of enamel or lacquer, then set out to dry.

You can improvise either a vertical or horizontal tank that will do for many dip-painting jobs. Size them for the work at hand and you can get by with a minimum of paint. There's little waste; just strain the leftover paint through muslin back into the can.—*Walter E. Burton.*

LINING A BOX with aluminum foil is an easy way to make a tank. This also speeds the clean-up job when you're through painting. If a large number of parts must be dipped, stir the paint occasionally. Be careful not to whip up bubbles. They will cause pock marks in the finished paint job.

DIP MODEL PARTS in a bottle of dope or lacquer, hold them over the bottle neck for 30 seconds. The solvent fumes will slow up surface drying, preventing riffles.

AFTER DIP-PAINTING THE HANDLES on tools, clamp them in clothespins or spring tongs to dry. Aluminum foil catches surplus paint. Remove "tears" from the handle ends with a soft brush several times during first five minutes.

SUCCESSIVE DIPPINGS in two or more colors give you a tool-identifying, ringed effect. Let the handles dry thoroughly between dippings. To control the thickness of each color band, steady your hand on another paint can.

HOMEMADE DERRICK lifts small parts out of paint at same speed as paint drips down, preventing sags in finished job. Nail "stop" holds the derrick crank between lifts.

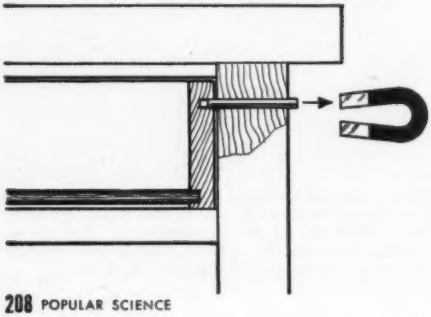
YOU CAN STAIN small wood parts quickly and evenly by dipping them in the container. Because the wood absorbs the stain, there is little or no after-dripping. If you use a tank instead of the stain jar, the wheels and beads can be spaced out on a piece of wire and dunked en masse.

Hooked Board Holds Catch for Cleaning Job on Fishing Trip

You can take some of the work out of fish cleaning, and enjoy an outing more, by making a cleaning board part of your tackle. The one shown is an 18″ length of one-by-12. Hooks in the ends anchor the fish, and a cleat at one end levels the board on a slope. The hooks are galvanized nails, driven through and bent.—*C. R. Hull, Santa Ana, Calif.*

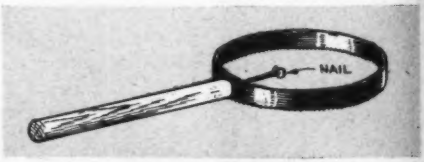
Magnet and Rod Lock Drawer

For a simple lock on any drawer, use a steel rod and a magnet. Just drill a hole through the chest into the side of the closed drawer. Insert a loose-fitting steel rod and cut it off flush with the chest. Use a small magnet (drawing below) to withdraw the rod whenever you wish to unlock and open the drawer.—*Robert L. Hay, St. Petersburg, Fla.*



Spring Clip Holds Hose Nozzle

A hose nozzle will always be handy if you nail or screw a spring clip to the wall just above the faucet. When you want to use the nozzle, just pluck it off. —*P. Casperson, El Cajon, Calif.*



Hacksaw Blade Cuts Weeds

A hacksaw blade makes a handy weed cutter. Bend the blade into a loop and nail it to a wooden handle. The far end of the blade cuts through stems easily. —*Mrs. Norman Hastings, Windsor, Mass.*

Engineer's Report: **1956 CHEVROLET**

Built-in balance lets a race driver do this

By **ED COLE,** *Chevrolet Chief Engineer*

There's a saying among race drivers: "You can't beat a Chevy through a corner." And though we didn't design the 1956 Chevrolet as a race car, we're flattered.

We know that one of the main reasons Chevrolet clings to the road like a magnet is *balance*—the correct weight distribution between front and rear wheels. A car that is "nose-heavy" tends to plow straight forward in a sharp turn. And because the rear end is light it also tends to break traction and skid.

Note this important fact: *a Chevrolet V8 has less weight on the front wheels than any other full-size car!*

The stock car racer you see here barreling through a turn is clinging at the very limit of traction—an acid test that you may never give your car. But the *balance* that has made Chevrolet the NASCAR Short Track champion by a wide, wide margin is just as vital for you at 30 miles per hour on a wet, slippery black-top road. This new feeling of stability is something you'll enjoy trying for yourself . . . so why not let your dealer arrange a demonstration drive as soon as you can. . . . Chevrolet Division of General Motors, Detroit 2, Mich.

CHEVROLET

tional Research Fellow at Princeton, he duplicated airglow in his laboratory. He did it by sending an electrical discharge through a mixture of active nitrogen and oxygen at low pressure. This won him considerable academic attention and even some public notice.

Early in World War II, Dr. Kaplan helped the Army Air Forces and Navy expand their weather services. He was on leave from his university post for two years as Chief of the Operations Analysis Section of the Second Air Force, and later of the Air Weather Service. These wartime contributions to the nation won him a decoration for Exceptional Civilian Service in 1947. That same year he was appointed to the Air Force Scientific Advisory Board, and has been on it ever since, serving several years as chairman of its Geophysics Research Panel. Whenever he travels on the Board's business, he has the temporary rank of lieutenant general.

Dr. Kaplan was one of 12 children. His father was both cantor and butcher for the congregation of the Jewish synagogue in Tapolcza, Hungary. When Joseph was eight, the family emigrated to Baltimore. They were woefully poor, and little Joseph's schooling was somewhat spasmodic.

In those days it was common practice to seat a class alphabetically at the start, shifting the smartest pupils to the front row as they proved their worth. Young Joseph began every one of his intermittent sessions at school with the same vow: "I'm only a *K* today, but next week I'll be up front." And, says his wife, he always made it.

A rare aptitude for mathematics and a passion for organization were his even when he was a boy. Both were responsible for attracting the attention of a shopper who set him firmly on the path to his future career.

Joseph was then a high-school student, working afternoons in a chain grocery. Every day this scholarly customer would seek him out to tot up his purchases. He often complimented the boy on his brisk neatness and on the speed and accuracy with which he summed up costs and made change. One day he introduced himself as a mathematics professor at Johns Hopkins University—a world-famous man, Joseph later learned. He urged young Kaplan to try for a particular scholarship there and offered to recommend him for it. Joseph pounced at the opportunity and won the scholarship.

At first he intended to be a chemical engineer, and at 22 got his B.S. degree in that subject. But as he pushed on towards a master's degree, he found that physics attracted him like a magnet. Physics has been his chief enthusiasm ever since.

Dr. Kaplan came to the Los Angeles campus of the University of California in 1928, and started up the academic ladder to a full professorship and chairmanship of the Physics Department. He later founded the Institute of Geophysics at UCLA and was its first director.

An amiable man with iron-gray hair, "Dr. Joe," or "Uncle Joe," has many claims to campus renown.

He is touted variously as a dynamic and humorous lecturer, a liberal marker, a talented mixer of mint juleps, an able golfer, and a professor with unusual appreciation of the student's viewpoint.

As UCLA's faculty delegate to the Pacific Coast Conference, he helps draw up rules for the athletic programs of PCC colleges. Another noted scientist, Dr. Glenn Seaborg, Nobel Prize winner in chemistry, is an enthusiastic fellow worker at this congenial task.

Dr. Joe's more cloistered associates are somewhat baffled by his lengthy list of memberships and chairmanships of national and international scientific bodies. "Where," they ask, "does Joe find the time?"

Many of his fellow planners of the International Geophysical Year, dazzled by his unflagging drive and jam-packed schedule, have wondered the same. END

NEXT MONTH: Answers to 20 common questions about earth satellites.

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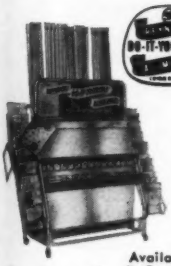

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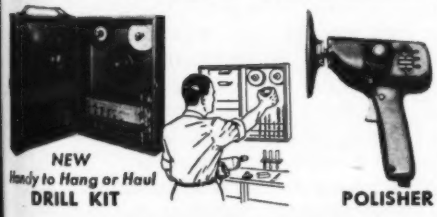

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STANLEY

[*Continued from page 148*]

little oil eating, and there had been no excess fumes issuing from the crankcase breather pipe to indicate badly worn cylinders. Hank Smoot, Gus told himself, wouldn't get home tonight. It was going to take a valve grind to fix this one.

Gus was so sure this time that when he pulled the spark plugs again and ran a compression test, he could hardly believe his eyes. The gauge showed that compression was about equal on all cylinders and only a few pounds below normal. What have we here, he asked himself, as he dug out and lit his pipe.

"Right smart gadget," Smoot said, looking at Gus's compression gauge. "But gadgets don't get me on my way. Tell me, Wilson, do you really know what's wrong with my car?"

"No," Gus admitted honestly. "I don't. I thought I did when you first drove in, but when the intake gaskets and the carburetor check didn't do the trick I sort of got off."

"I see," Smoot said soberly. "Just like old Blue here. I recall the time Mose Wallgren's little tot got lost on the mountain with night and a storm coming down. Cute as a picture she was, four years old, with a pink ribbon in her hair. Folks came racking up to my place after me and Blue, like they always do when anybody's lost or hurt in the hills. Blue got on the girl's trail right away, nose to the ground, tail wagging, like a hound does when he's sure of himself. Then, way up there beyond the ridge, Blue began to act uncertain, back-trailing, sniffing with his head high . . ."

THE old man's eyes became bright with memory, and his wrinkled hands stroked the great hound's head.

"You know, Wilson," he said, "I thought for sure then that Mose Wallgren's daughter was a goner, with night coming down and the clouds spitting snow. But Blue turned back and picked up the trail where he'd lost it. We found Mose Wallgren's daughter cuddled up in a pile of leaves, scared but safe."

Gus's mind went back several years to newspaper headlines he'd read, and a sense of shame came to him. He'd been laughing at this bewhiskered old man and his hound, he thought, yet together they had done something that put anything he'd ever done to shame.

"Yes," Smoot declared, "it's the feller who can get off the trail, then turn around and admit it, and get on it again, who sets off the powder under the stump."

He'd been so sure, Gus thought, that his first guess was right. Then he'd tried everything, and come up with burned valves. When the compression gauge proved him wrong again, he hadn't known where to turn. Maybe he'd better do some backtracking himself.

CONVINCED more than ever that his original hunch had been right, Gus began a systematic check of everything that could affect carburetion. Finally he pulled the intake manifold again and inspected it minutely with a pencil light.

Suddenly Gus paused. "Aha, what's this?" he murmured, steadying the light on a pea-sized hole that had been burned through the stack that led down through the exhaust stove to the intake. The gas mixture drawn into the carburetor had been sucking exhaust fumes through the hole, effectively killing the vacuum.

Gus sent his helper, Stan Hicks, for a new manifold. When this was installed the engine purred like a kitten.

"Some trails," Hank Smoot declared as he got behind the wheel, "are a mite hard to follow, Wilson, even for old and wise heads. Well, I reckon I'd best be getting on home. Hop in, Blue."

Watching the venerable station wagon go down the street, Gus was thoughtful.

"Queer duck, wasn't he," Stan Hicks commented.

"Queer, perhaps," Gus said, "but wise, and the salt of the earth." He chuckled. "Anyway, I never thought I'd see the day when I could learn a lesson in trouble shooting from a hound dog." END

NEXT MONTH: Gus seizes at a straw.

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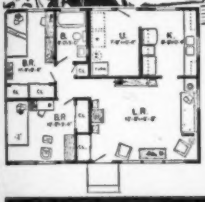

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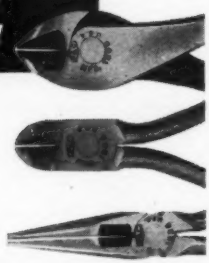

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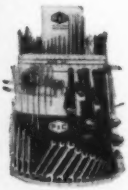

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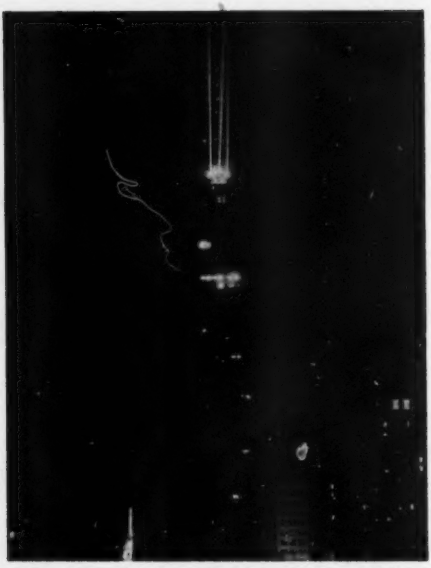
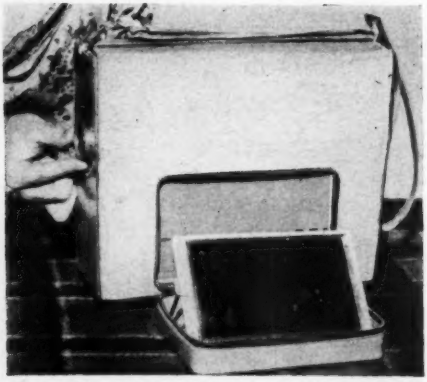


Empire State Shines 300 Miles

FOUR 450,000,000-candlepower beacons have been installed at the tower base on New York's Empire State Building, the world's tallest. Visible from aircraft as far as 300 miles away, they sweep in horizontal and vertical arcs.



Now You Can Have a Solar Radio

SUN-POWER radios, shown in an experimental model six months ago, are being made now for the public. Admiral has a six-transistor portable that runs on six flashlight cells or a 32-cell pack operated by sun or infrared lamp. The set is $59.95, the solar pack $175 extra.

America's Biggest Uranium Mine

[*Continued from page 132*]

Only gradually has the sensational size of the Jackpile strike come to light. Its story began when Jack Knaebel, Anaconda's local manager, negotiated prospecting rights on the Laguna reservation several years ago. Flying his own plane and using a hand-model scintillometer, he found a radioactive hot spot.

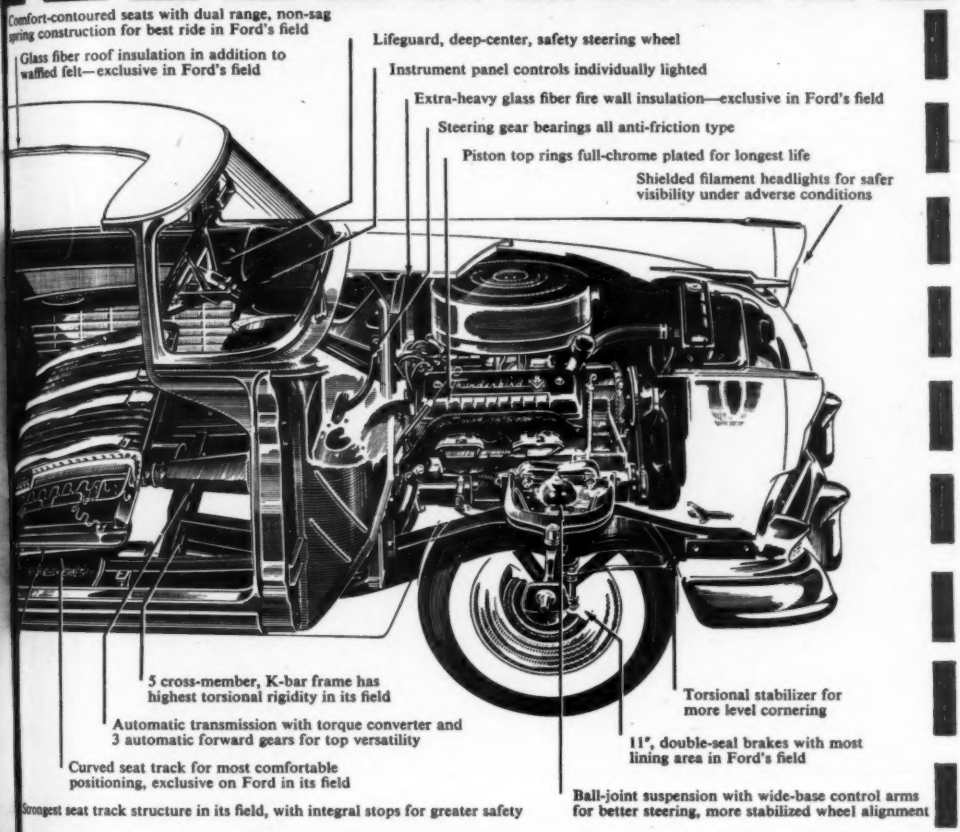
The clue led a ground party first to a moderate-sized uranium deposit, which they named the Jackpile ore body. Widespread drilling then picked up the record-sized uranium deposit, called the Jack-

A pedestrian is a father who recently taught his son to drive the family car.
—THE SIDEWALK SUPERINTENDENT

pile Extension, a quarter-mile away. Developing both has now been merged in a single great excavating operation.

Big-scale U.S. uranium mining is something new and momentous. Formerly, midget mines were typical, and finding a 20,000-ton ore deposit was a major event. Now three districts are known to hold millions of tons apiece: the Big Indian Wash-Lisbon Valley area of Utah, opened with a spectacular strike by the lone prospector Charles Steen; the Laguna Indian Reservation site of the Jackpile Mine; and the Ambrosia Lake deposits of McKinley County, N.M., found only last summer. Eighty percent of our known uranium-ore reserves have been developed in the last three years.

Presumably it's this new abundance of uranium that has enabled the U.S. Government to release 88,000 pounds of the U-235 variety for peaceful A-power use here and abroad. Another result has been to take the heat off researchers seeking ways to get uranium from low-grade shale and phosphate ores—which was foreseen as necessary to meet defense needs. "With the discovery and development of more economic sources, this no longer is the case," the AEC says.—*Alden P. Armagnac.*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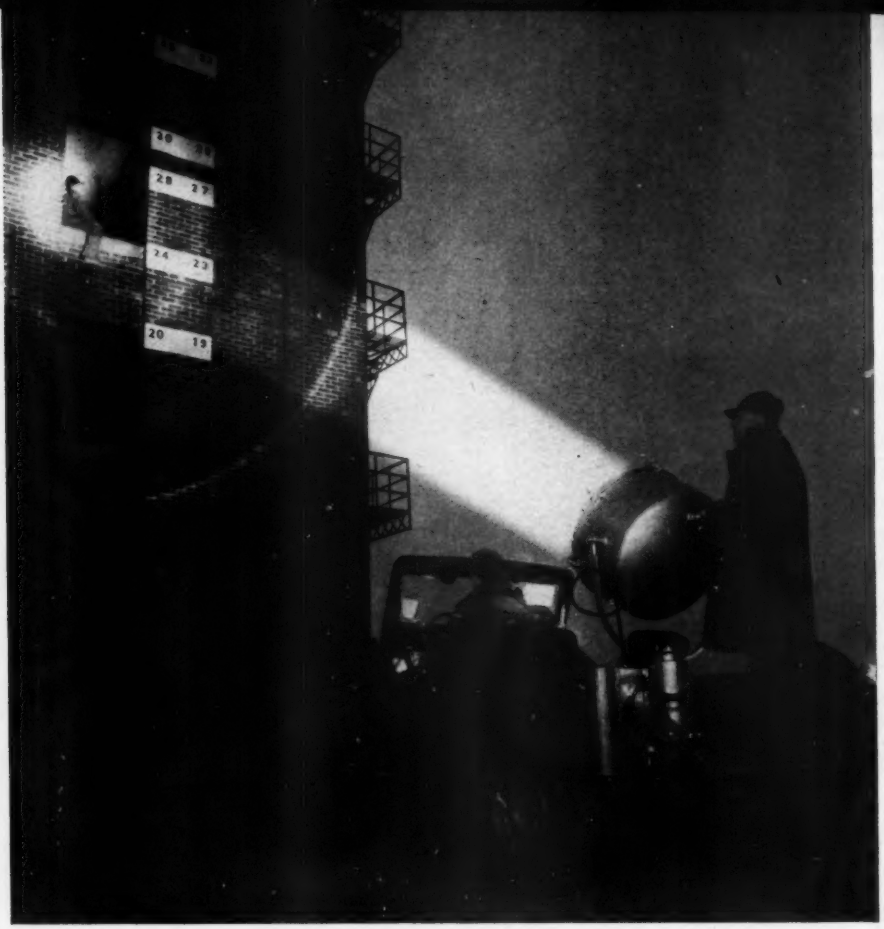
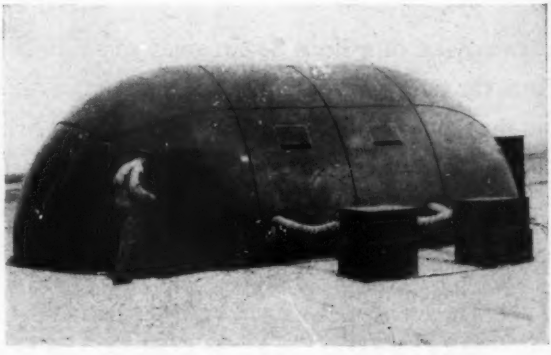


This Jeep-Powered Searchlight Casts a 2,000-Watt Beam

EQUIPPED with a built-in power plant, this rough-terrain Willys Jeep drives its swivel-mounted searchlight close to the job although the 2,000-watt beam can carry for several thousand feet. The 2½-kw. generator operates on a power takeoff. The unit was built for a foreign country for border patrol work.

Prefabricated Igloo Built of Fiber-Glass

A NEW fiber-glass igloo developed for Marine Corps fliers is undergoing tests for both arctic and tropical use. The self-insulated hut is equipped with heating and air-conditioning units. The structure, 20 feet wide and from 20 to 60 feet long, can be put up in about 45 minutes.



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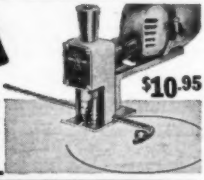

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Wilson-Imperial Co., 121 Chestnut St., Newark 5, N.J.

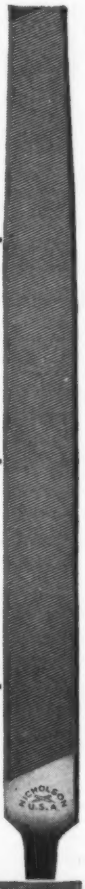
Summertime is fix-up time

Summer chores can be simplified if you keep your lawn and gardening tools sharp with a Nicholson or Black Diamond file. For example:

Blades of your rotary lawn mower should be touched up regularly with the famous Handy file. The double-cut side is used for fast metal removal, the single-cut side for smoothing and sharpening.

Sharp hoes and rakes cut down on achin' backs! Use the popular all-around Mill file for garden cutting tools.

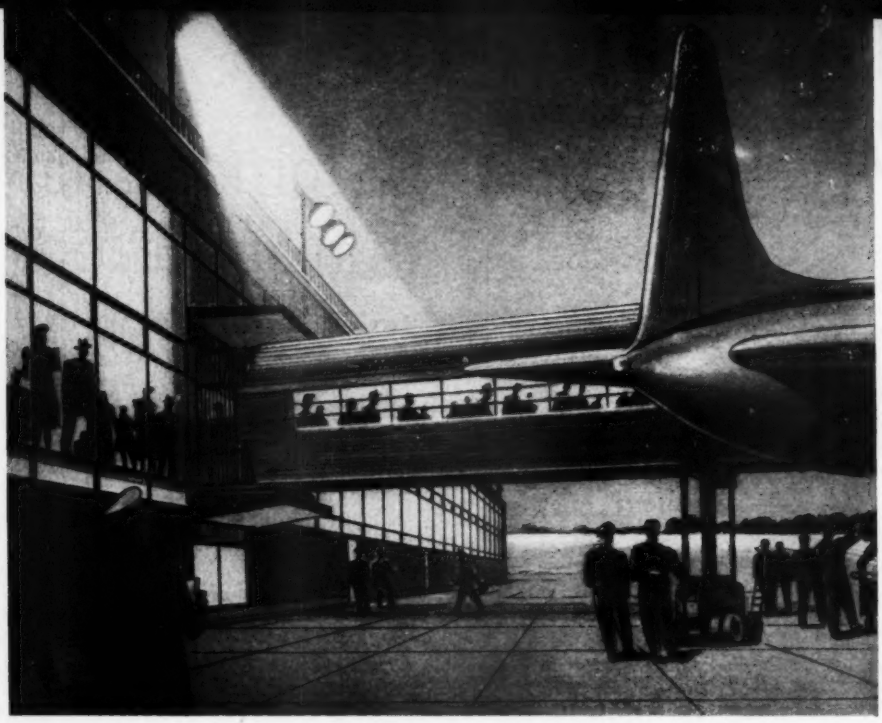
Stop that screen door from sticking with the versatile 4-in-Hand. Half round and flat, file and rasp, it's four files in one. Ideal for a multitude of summer uses.



Nicholson and Black Diamond files are available at all good hardware stores.

NICHOLSON FILE CO.
Providence 1, R.I.
(In Canada: Nicholson File Company of Canada Ltd., Port Hope, Ontario)

NICHOLSON FILES
A FILE FOR EVERY PURPOSE



Swiveling Gangplanks Will Keep Flight Passengers Dry

COVERED aluminum bridges are planned to enable passengers at Chicago's big new O'Hare Field to board and leave planes in driving storms without getting wet. Hinged to the terminal by plastic accordion bellows, the ramps would telescope out to 103 feet and swing on a wide arc, like a kitchen faucet.

Television Screen Shows What You Can't See in the Dark

A MODEL, whose face studio visitors couldn't see 12 feet away in a darkened room, shows up clearly on the TV screen behind her. The picture was caught by RCA's new "wide-spaced image orthicon" tube in the camera at right. It is basically a standard pickup tube with sensitivity increased five to 10 times.

THE ORIGINAL
PACKAGED BOAT KITS

Made ONLY by *Custom-Craft*

Top Performance, Design, Styling! Over 70 Models 8 to 21 ft

World's largest line! Over 200 Boats: Kits, Formed-Hulls, Semi & Custom-finished! All types: Prams -Cruisers! Easy to build! Flying stern, Tredronic bottom, Bulkhead construction!

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52 pages: Includes Victory Series, hardware, paint accessories, Fiberglas! Send $1.00 for Catalog Plus "Boating Handbook". DEALERS-AGENTS INQUIRE

BOAT PLANS & PATTERNS Frame-Pac Kits

World's largest selection: over 200 plans, full-size patterns, frame-pac kits! Designed strictly for amateurs! All types: prams, kayaks, racers, runabouts, catamarans, houseboats, cruisers - inboard-outboard 6-40' wood-plywood-steel!

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"THINGS TO MAKE ON TOOLS YOU OWN"

NEW DELTA hard bound book illustrates and clearly describes a wide selection of useful projects designed to be built on each of the basic tools you own—only $1.00. Send for FREE folder on complete Delta Library: Delta Power Tool Div., Rockwell Mfg. Co., 504G N. Lexington Ave., Pittsburgh 8, Pa.

EXCLUSIVE DOUBLE-BEARING
HEAVY DUTY PUMPS

IRRIGATE • DRAIN • CIRCULATE • SPRAY

Up to 7,500 GPH; 1,000 GPH 60' high; or 3,000 GPH from 25' well. Use ¼ to 1 HP motor. 1¼" inlet; 1" outlet. Stainless shaft. **TYPE X**—2 oil-less bronze bearings. Won't rust..... **$10.95**

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MONEY BACK GUARANTEE

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DO A BETTER JOB with **DREMEL** Straight-Line-Action **SANDERS**

Send for FREE Power Tool Catalog

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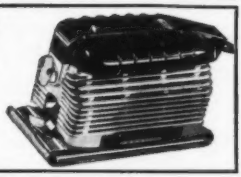

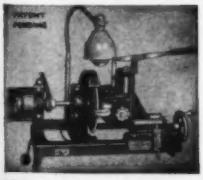

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"GUM" CIRCULAR SAWS
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- For home—farm—shop!
- 20" assembled and balanced aluminum fan blade with steel hub
- 4840 cubic ft. of air per minute
- Rubber mounted bearings
- Complete V belt drive
- Steel fan shaft & collars
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- All you need is any ¼ to ½ hp 1725 RPM Motor a Screw Driver and 20 minutes time to assemble this wonderful home or shop fan kit. Quality at low cost!

FAN KIT ONLY $16.95

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AT LAST! Make Floors, Patios, Driveways and Walks Look Different—use ROX

TESTED FOR YEARS

Something *new* and *exciting* in decorating! Now Rox shows you how to design a shuffleboard, a hopscotch block and many other interesting or decorative patterns for porches, basement floors, driveways and patios. See booklet below. If you are tiling your floor, seal out moisture with Rox first. And remember . . . *Rox is guaranteed not to blister or peel!*

Beautiful, Durable Exteriors with ROX

Before

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Masonry walls absorb tons of water—this water, if not kept out, can deteriorate masonry. Rox becomes part of the masonry surface itself as it seals this surface and protects against water even in gale driven rains. Rox adds distinctive exterior beauty.

Guaranteed to Protect Basements Against Water Leakage!

With Rox, you can convert your basement to a usable recreation room or workshop where tools are safe from moisture.

Before After

Rox is available in 5 colors and white at authorized Rox dealers in U. S. and Canada.

Helpful Booklet Gives Game Diagrams and Beauty Hints

Illustrated in color to help you apply that professional decorator touch as you protect and beautify your basement and masonry surfaces. Diagrams and explanations to make shuffleboard and other games or decorative designs on floors, patios, driveways, walks, etc., and give new interest to masonry walls. Send 15c for handling. *Rox Products Co., Dept. S7, Detroit 27, Michigan.*

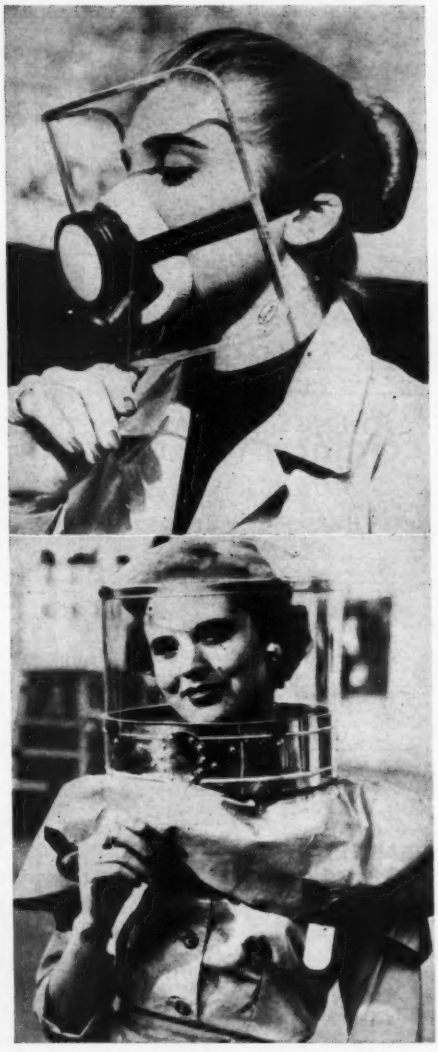
© ROX PRODUCTS CO.

"Desk Lamp" Gets a New Job

THIS goosenecked lamp towers above one of Washington's old-fashioned light poles to bathe Pennsylvania Avenue in mercury vapor light. It's one of six modern street lights being tested to brighten up the nation's capital.

Here's a Spoonful of Hearing

TRANSISTORS so tiny that 150 fit in a spoon are used in a new hearing aid worn on the sidepieces of eyeglasses. An A battery only a bit larger than an aspirin tablet runs the hearing aid. Radioear of Pittsburgh makes it.



Wrapped in Fancy Trappings, Workers Gather No Dust

PRETTY models lend allure to these fashions for the hard at work, which were shown at a London safety-equipment exhibition. The girl at top is displaying the latest thing for wear in plants where the air is aswirl with dust or powdery chemicals. The space helmet and cape in the lower picture are intended for wear while spraying crops. Both outfits protect the wearer's eyes.

NEW! 4-FOOT T-SQUARE!

Dealer inquiries invited

FOR FULL-SHEET WORK! BUILDERS! CARPENTERS! HANDYMEN!

CUT! SQUARE! MEASURE!

Flat right edge of SURE-SQUARE makes accurate pencil or knife guide for instant squaring, marking and measuring plywood, etc.; also for scoring tile, glass and metal. Turned up left edge a useful guide for portable sawing and routing. Many uses, low price make SURE-SQUARE a "must" for the professional or amateur builder. See your dealer or order direct today!

SURE-SQUARE is made of rugged 18-gauge steel. 4-foot blade makes full-sheet work easy. Use on wood, hardboard, wallboard, plasterboard — even glass! Blade and 2-foot cross-bar calibrated in 1/4 in.

Only **$3.95** Postpaid

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PIONEER PRODUCTS

901 Fairview Ave. North Seattle 9, Washington

New Black & Decker 6½" Heavy-Duty Saw cuts 2x4's at 45°!

$64.50 Extra Capacity • Extra Power • Extra Safety • Extra Convenience • Extra Adjustment Features

See your B&D dealer for demonstration today! THE BLACK & DECKER Mfg. Co., Dept. S-76, Towson 4, Md.

CUT RADIO CHASSIS HOLES IN 1-1/2 MINUTES OR LESS

Quickly make accurate round, square, key, or "D" openings . . . in metal, bakelite or hard rubber . . . with GREENLEE Radio Chassis Punches. Simply turn with a wrench. Many sizes. Write for details. Greenlee Tool Co., 2127 Columbia Avenue, Rockford, Illinois.

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The "Little Marvel" all-metal welder. 5-year written guarantee. Welds 1/8" metal or money back. Repairs tanks, tools, fenders, machine parts, etc. Complete with everything—rods, unit, eye shield, directions. $6.95 plus 50c postage. Flame torch accessory for soldering, cutting, brazing $3.95 complete with carbons, brass rods, flux. $2.00 deposit on C.O.D. 75 Ampere ¾ inch Transformer Welder $21.95 F.O.B.

$6.95 Complete

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CLOSE OUT! HEAVY DUTY 6-VOLT MOTOR

ALL BRAND NEW! ORIGINAL PRICE $16.50. Only $1.49

Just 1200 Left—Hurry!

A terrific buy! Oilite bearings. ¼ inch shaft. High starting torque. Enclosed body. Perfect for car heater & defroster or any 6 volt battery operated mechanism. Send $2. ($1.49 plus 51c) and we'll ship postpaid on 10 day money back offer.

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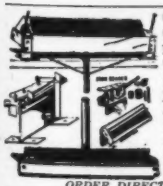
When Writing to Advertisers Please Mention Popular Science



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Forms angles, locks, pans, etc. Quick eccentric clamp. All steel construction.

15"—16 gauge steel	$23.50
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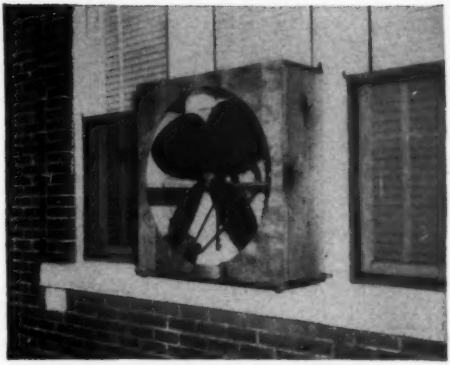
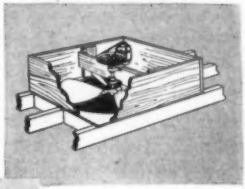


FEW DOLLARS BUILDS A BREEZE WITH EASY TO ASSEMBLE FAN KITS

SAVE UP TO 75% ON WINDOW & ATTIC FANS

The New All-Purpose Fan Kits insure dependable performance as Window Fans or for Standard and Horizontal installations in attic. No additional parts needed.



KITS OF PARTS, with step-by-step instructions, include: Aluminum fan spider, Masonite blades, Shaft, Oilite bronze bearings, collars, pulleys, belt and bolts.

No special tools or skill are required to install your own modern home cooling system . . . Invigorating, refreshing outside breezes can now cool your home at the lowest price ever. The Fan Kit, assembled with ease by thousands and sold on a money-back guarantee, is now built for window and Standard or Horizontal attic installation. Thoroughly tested for dependable performance, every kit includes all the parts you need plus complete instructions. The only additional requirements are a few pieces of lumber for fan housing and a new or used ¼ HP 1750 RPM motor.

Sizes are available for every need.

30" Fan cools average home, 6000 CFM	$14.95
36" Fan cools larger homes, 8000 CFM	17.95
24" Fan cools smaller homes, 4500 CFM	13.95
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You buy direct from Manufacturer. Orders accompanied by check or money order shipped postpaid. Deposit of $3.00 required on C.O.D. orders. Immediate delivery. Satisfaction guaranteed. Circular Free. Dealer inquiries invited.

FAN KIT COMPANY

154-T, NO. BELVEDERE

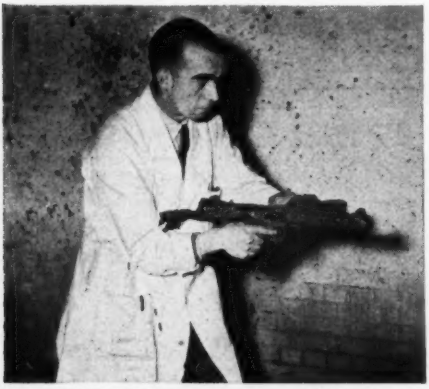
MEMPHIS, TENN.

What Moves Tombstone Ball?

THIS 2,100-pound granite ball on a tombstone in Harrisonville, Mo., used to rest on the flat, white spot facing the camera. In 58 years it has rotated a distance equal to a fourth of its circumference. No one has an explanation for it.

Cone Speeds Chicken Weighing

How to hold a live chicken still long enough to get it weighed is a tough problem that has apparently been solved in Hertfordshire, England. The cone-shaped cylinder permits the indignant fowl to breathe but not to kick.



Mud Can't Foul Submachine Gun

THIS six-pound submachine gun keeps firing even after a mud bath. The nine-mm. Sterling, which replaces the Sten gun in the British Army, carries a 34-round magazine. With the stock removed, it can be used as an automatic pistol.

Mirror Widens Headlight Beam

TO HELP motorists see better at night, the West German Automobile Club has developed a mirror-like attachment to fit in front of headlights. It's said to improve highway visibility by deflecting some of the light to the side of the road.

HANDY TIPS YOU CAN USE!

1 Use **AMERICAN Dripless Oil** for best lubrication and rustproofing of guns, fine mechanisms and appliances. Runs in—won't run out. 29c.

2 Use **DOOR-EASE Stainless Stick Lubricant** for things that stick or squeak — doors, drawers, windows, zippers. Apply like a crayon! 15c and 39c sizes.

3 Use **LOCK-EASE Graphited Lock Fluid** to give car and other locks best year-round protection against freezing, sticking and rust. 39c.

At leading stores, or send $1.00 for SPECIAL KIT of all large sizes to Dept. S-7
American Grease Stick Co., Muskegon, Mich.

Porter-Cable

Quality Electric Tools

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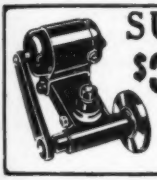

$39.50 Less Grinding Wheel

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REGULAR PRICE $125.00
1-6 H. P. MOTOR
TAKES WHEELS UP TO ½" x 4"
EXTRA QUILL EXTERNAL OR INTERNAL $19.50
MONEY BACK GUARANTEE

EDWARD J. NOLAN, PULASKI, NEW YORK

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INSTRUCTION BOOKS SHOW YOU HOW . . 75c EACH — 2 Bks - $1.00
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FREE! Instructions and Literature on kits.

Complete "Install-It-Yourself" Air Conditioner kits for home and automobile. 2 Ton capacity. Brand New Parts—**$124.40 and up.**
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Explore, learn Electricity, Magnetism, Electromagnets, complete kit and instructions with 22 experiments and models.....$3.98
TRANSISTOR RADIO KIT—all parts & instructions—powerful..$7.95
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WELD BRAZE SOLDER CUT

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Complete with Twin Carbon Arc Torch and accessories . . . to handle all metalcraft work.

Acclaimed by thousands of Homeowners, Mechanics and Hobbyists as the welder of 1001 uses. Easily operated from properly wired 110 volt AC or DC line. The ideal gift with a life-long use . . . Order today on 10 day money back guarantee.
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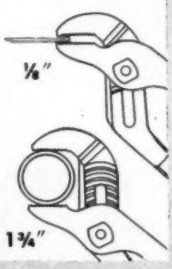
help yourself to the handiest plier ever designed

CHANNEL LOCK

No. 420

GRIPS LIKE A PIPE WRENCH



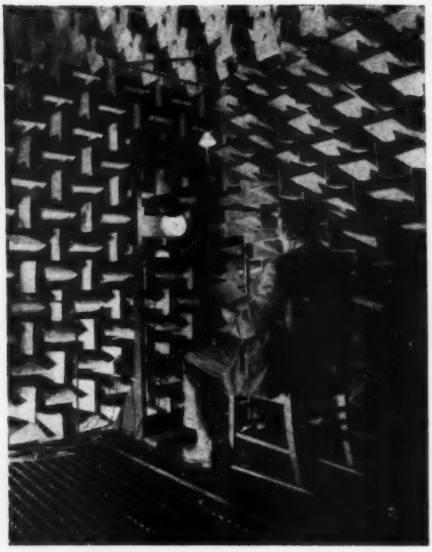
No other plier does so many jobs so well as a Channellock No. 420. Grips anything from a small cotter pin to a 1¾" hex nut. And what a grip! Just like a pipe wrench. What's more, Channellocks are streamlined . . . easy to use in hard-to-get-at places. Ask your hardware man for a Channellock plier. You'll soon agree with thousands of other craftsmen . . . Channellock is the handiest plier of them all.

BE SURE IT'S A GENUINE CHANNELLOCK

CHAMPION DEARMENT TOOL CO. MEADVILLE, PA.

TV Camera Fits in Palm

RADIO'S prankish "hidden mike" may be about to invade television. What its German makers call the world's tiniest TV camera can be palmed or concealed in a potted plant. The key to the instrument, put out by the Grundig Works of Fuerth, Bavaria, is a miniature tube of high sensitivity called the "mini-resistron."



Want to Hear Every Whisper?

GLASS-WOOL wedges jutting from walls, ceiling and floor make this one of the quietest rooms. Next to it at Indiana University is the noisiest, a reverberation chamber with smooth walls at many angles. They are used in a study to analyze sound and improve voice communication on airfields and flight decks.

One-Woman Assembly Line

A "MERRY-GO-ROUND" seat that travels all the way around a full-circle track enables a single operator to run a battery of automatic precision machines. The unit is used by Smiths Clocks & Watches at its Cheltenham, England, factory.

Camera Clips onto Spectacles

THIS novelty camera, which can be worn over eyeglasses, is said to take tiny pictures from which good enlargements can be printed. Made by Colibri, Nuremberg, Germany, it has a frame finder over one eye. It is not on sale in the U.S.

With a Harley-Davidson **HUMMER** you can

save up to $585 a year

on transportation to and from work!

If you're thinking of buying a car primarily for transportation to work, stop for a minute, check chart at right to see how much money you can save by getting a Harley-Davidson Hummer!

But in addition to savings in money, a Harley-Davidson Hummer saves time in traffic, ends your parking problems.

And don't forget, a Hummer packs plenty of pleasure in every mile. Man, it's really invigorating to hit the road with your Hummer after a hard day's work.

See your nearby dealer today or write us for free literature You'll be glad you did—money-wise, pleasure-wise.

COMPARE THESE YEARLY COSTS

Based on $2000 automobile and $345 Hummer (avg. national price). Both machines purchased on one-third down payment.

AUTO		HUMMER	
Depreciation (25%)	$500	Depreciation (25%)	$ 87
Insurance*	120	Insurance*	100
Interest on loan	86	Interest on loan	14
License*	16	License*	5
Gas and oil (5200 miles annually, 15 miles per gal., 30¢ per gal.)		Gas and oil (5200 miles annually, 100 miles per gal., 30¢ per gal.)	20
Plus $5 per year for oil	109		
	$811		$226

*Based on average figures.

HARLEY-DAVIDSON MOTOR CO.

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Money-Making Tools!

It's easy to own the same "pay-off" tools used and endorsed by America's top-earning mechanics! You can start building your own kit with basic Snap-on sets—add others any time. Never sold in stores—direct to users only. Send today for free catalog!

Snap-on Tools Corporation
8060-G, 28th Ave., Kenosha, Wis.

WORN ENGINE BURNING OIL!

Reduces oil bills!
Restores compression!
Increases miles per gallon!

Forms self-lubricating seal at piston top. Inserted through spark plug holes. Used by millions of motorists. Tested and approved by motoring experts.

$4.95 Tube for most cars

Write for Full DETAILS

*PISTON SEAL

See Your Neighborhood Auto Accessory and Parts Replacement Store

TREGLOWN CO. INC., FANWOOD 90, N.J.

*TRADE MARK REGD. CANADA: 1366 Greene Ave., Montreal 6 (prices higher)

Holt's HAVE THE ANSWER!

REPAIR MUFFLER AND EXHAUST LEAKS in 10 min.

The plastic gas-tight seal sets hard, withstands heat and vibration. Prevents carbon monoxide gas poisoning.

$1.69 per can

SETS LIKE A WELD—NO TOOLS NEEDED

*Holt's GUN-GUM MUFFLER PLASTIC SEAL

[*Continued from page 94*]

descend. Service was somewhat erratic.

The electric elevator, one of the most significant of all inventions, came along in 1889. Its capacity for high speed opened the way for skyscrapers and changed the skylines of the world. But for its fleet of 216 elevators, which carry a quarter of a million people a day, Rockefeller Center couldn't exist. Nor could the Empire State Building, which has seven miles of shafts and the longest elevator run in the world—997 feet from a sub-basement to the 80th floor.

As lengths of runs increased, and speeds of cars shot upwards to as high as 1,400 feet a minute, elevator problems multiplied. In tall buildings cables may stretch as much as two inches. They contract on cold days and lengthen on warm days. Leveling of cars at floors became a problem—most people were asked to step up or step down. Automatic leveling devices were the answer—either photo-electric cells at each landing, or magnetic switches atop cars which exactly jibed with metal plates set in the shaft at each landing.

Speed was also a problem. Too rapid acceleration or too rapid deceleration displaced internal organs of passengers—giving that "sinking feeling." "Bring my stomach down next trip," became a favorite taunt of passengers to operators. Engineers helped solve this by means of elaborate control devices. One such device is a miniature elevator in the control room which exactly duplicates the up and down motions of the elevator it monitors. Speed adjustments on the model are translated into speed adjustments on the passenger car. As a final check, Westinghouse developed a "mechanical stomach"—which measures acceleration rates and keeps them within comfortable limits.

Other pieces of unusual gadgetry were perfected. Heavily loaded up-cars are large consumers of power. Heavily loaded down-cars actually *generate* electricity—pushing power back into lines via their motor-generator sets.

The automatics incorporate all these features, plus a host of new ones. Are they as safe as manually operated cars? Equally safe, most engineers agree—no accident has yet been reported that can be attributed to automatic features. There is virtually no chance of getting caught in doors. Multiple safety devices prevent it. In one system, invisible beams of infrared light cross the entrance way. Each time an entering passenger breaks a beam, the door-closing device resets itself, in effect starting all over again. Thus, a stream of 15 or 20 people may enter the car without any annoying "door flutter."

In addition to such electronic controls, there are also mechanical controls in the rubber edges of the doors. One Westinghouse engineer demonstrates their sensitivity by letting a closing door bump him in the nose. No blood flows. At the slightest touch the door politely bounces back.

Danger of falling? Virtually non-existent. As a rule, cars are hoisted by six cables, any one of which is strong enough to carry a full load. If power partially fails, mechanical brakes lower the car to the nearest floor. If all power fails and a car is stuck in a shaft, there is an emergency exit door at the side of the car. Another elevator is pulled alongside in the adjoining shaft and stuck passengers step directly from one car into the other.

Automatics have some marked advantages to building owners. It costs $5,500 to $7,000 a year to man an elevator in a business building—including operator's salary, uniforms, insurance, welfare benefits and such. In hotels, which must provide three shifts of operators, costs rise as high as $14,000. Automatics erase the labor charges. They have other advantages as well.

Buildings that modernize by installing automatics find they get along with fewer cars. Thus, the Hurt Building in Atlanta found that 11 automatics did

[*Continued on page 230*]

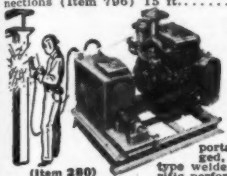
EXTENSION CORD

Heavy duty and very flexible. Neoprene 14-2 cable, 30 year quality. Wt. 12 lbs. (Item 185) 100 ft. Complete with rubber plug and outlet. A terrific buy at only **$8.95**

No. 10-2 POWER CABLE. Heavy duty, very flexible, rubber covered, 50 ft. with male and female fittings. Wt. 9 lbs. (Item 592a) **$10.45**
50 ft. without fittings (Item 592) . . . **$9.45**

NO. 12-2 POWER CABLE. Very flexible rubber covered, special outside shield for grounding power tools, etc. 50 ft. (Item 199) wt. 8 lbs. **$6.95.** 100 ft. (Item 200) . . **$12.95**

No. 14-8 Conductor Power Cable, heavy duty very flexible, rubber covered, with 8 contact plug & socket. Ideal for tractor-trailer connections (Item 796) 15 ft. **$9.95**



(Item 280)

MASTER DC ARC WELDERS

Now! a portable, rugged, industrial type welder with terrific performance, yet at a price hundreds of dollars less than you'd expect. Senior model made for years of trouble-free, continuous service. High capacity DC welding unit enables you to tackle any job with confidence—easily welds anything up to 2" plate using from 1/16" to ¼" rods. Built-in stabilizer and cooling system makes arc easy to strike and hold. Dual control rheostat provides low heat soldering, brazing and welding from 30 to 300 amps. Complete with instructions, guarantee and triple V-belt or flat pulley. Easy to hook up and easy to operate.

WELDER ONLY — DUAL CONTROL MODEL. Same as above, but drive with your tractor, jeep or gas engine of 14 HP or more. (Item 38a) Wt. 110 lbs. $450 value. **$119.50**

WELDER ONLY—INDUSTRIAL MODEL as above but with ceramic rotary type rheostat providing 74 different heat settings for all types of welding (Item 38 b) $500.00 value. **$139.50**

COMPLETE POWER MASTER (Illustrated above) powered by a 14.6 hp., air cooled Wisconsin engine. Wt. 480 lbs. Item 280) Compares with welder costing $1,200. Factory special **$449.50**

WELDING KIT Two 10 ft. leads, welding helmet, electrode holder, ground clamp. Sold only with welder at. . . **$10.50**

SAVE buy at factory prices direct from MASTER MECHANIC

(Item 24)

600-700 WATTS
PUSH BUTTON START

115 v, 60 cyc. AC Powered by a rugged 2 HP easy starting Briggs engine. No wiring necessary-just plug in and operate. Plenty of current for any oil burner, freezer, brooder, emergency lights, etc. which require up to 700 watts. Ideal for television and radios. Complete with Voltmeter and built-in winding to charge 6 v. auto batteries. (Item 24.) Wt. 75 lbs. Easily fits in car trunk. Be prepared if storm knocks out power lines. Reg. $275 value. **$143.50**

1000-1200 Watt Plant (Item 45) same as Item 24 but larger generator and engine with 50% greater output. **$199.50**
We make every type and size of light plants —Write, giving us your requirements!

JET STEAM MASTER

Now, a super efficient portable steam generator that produces live steam at 100 lbs. pressure in 60 seconds from a cold start! Produces large volumes of high pressure steam on 2 pints of fuel oil. Instantly cleans and melts grease, dirt, rust, old paint, etc. off implements and road machinery. Pays for itself in a few weeks. Sterilizes soil. Sterilizes as it cleans—milk equipment, etc. Fully automatic—oil fired with new, built-in lifetime bronze water circulating pump. Draws water from faucet or bucket. Simple and safe—anyone can use it; built-in safety valve. Complete with 12 ft. of hi-pressure steam hose and new triple efficiency steam gun that automatically mixes in soap solution if desired. Wt. 250 lbs. Item 463. Special factory price. **$329.50**

AUTOMATIC 6 VOLT COMPRESSOR

The ideal compressor for operating loud blast air horns on cars or boats, and for use as tire inflating equipment on service trucks or jeeps. Inflates tires in seconds. Compact! Can be installed in small space under hood, in trunk, etc. High air output (4 CFM). Operates on standard 6 or 12 volt storage battery current. Built-in ½ hp. electric motor. Solenoid switch. 6"x24" air tank, pressure gauge, safety valve, shut-off valve, automatic on and off switch. (Runs only when air is needed.) Wt. 39 lbs. Item 353 Reg. $129.50. Our Special. . . **$54.50**

HEATING & VENTILATING FAN

(Item 10) Easily installed in furnace pipes. Forces even heat to all rooms. Over range removes kitchen smoke and odors. Powerful, continuous duty motor, 110-130v. AC. Mount in wall or ceiling to ventilate any area. Quiet, super-efficient fan moves huge volume of air. (400 to 600 CFM).

8" Pipe, wt. 5 lb. **$6.85**
8" Pipe, wt. 6 lb. **$7.85**
10" Pipe, wt. 7 lb. **$8.85**
12" Pipe, wt. 8 lb. **$9.85**

HEAVY DUTY FAN. Semi-enclosed motor suitable for spray booths, restaurant exhausts, poultry houses, etc. 10" Fan, wt. 8 lbs. (Item 10E) **$11.95**
12" Fan wt. 10 lbs. (Item 10G) . . . **$12.95**
HIGH SPEED BARN FAN similar to above, but larger, high speed motor moves huge volume of air. 12" Fan (Item 10 f) **$14.95**
16" Fan (Item 10 E) **$17.95**

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Completely self-priming! No foot valve required. Tremendous capacity—100 gal. per min. ! . . Special impeller enables pump to handle muddy or sandy water. Simple to operate—simply start engine and watch the water go. Powered by a rugged, easy-starting 2 HP Briggs engine. Prelubricated sealed bearings for years of heavy-duty service. Big 1½" Model. Item 502. Wt. 70 lbs. Factory price. . . **$134.50**

2" Model (150 gal. per min.) with 2½ HP engine. Item 502a. 90 lbs. Fact. Spec. **$154.50**

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EASY TERMS ONLY $98.50 F. O. B.

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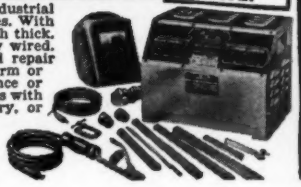

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1807 So. Clark St., Chicago 16, Ill.

Trindl "100-TESTED" ARC WELDERS

Guaranteed

12 MONTHS IN CONTINUOUS OPERATION

Two-Story Bike Keeps Him Dry

WHEN rain fills chuckholes in Minneapolis' outskirts, Bruce Larson keeps above the splash of passing autos. He raised his bicycle saddle and handle bars on extension posts, and mounted the pedals and sprocket on the saddle post.

New Light Is in the Groove

A RADICAL fluorescent tube, U-shaped in cross section, doubles light output by more effective use of energy that concentrates the light in the groove. The ridges are for strength. The General Electric tube will be available for industrial lighting sometime in the fall.

New Elevators Do-It-Themselves

[Continued from page 228]

the work of 15 operator-manned cars. Air-conditioning equipment was installed in the left-over shafts. Other buildings are using surplus shafts to provide needed closet space.

Automatics have still another great advantage. Elevator strikes can paralyze a city far more effectively than a stoppage of surface transportation. In bus, taxi, subway and trolley strikes people can get to work via car pools. But few people are willing or able to climb higher than the fifth or sixth floor of a struck office building or hotel. In effect, business comes to a standstill and the city's commerce dies. Automatic elevator service eliminates the possibility of these outgrowths of a strike threat.

Such facts, plus savings in operators' salaries are booming sales of operatorless cars. Shortly after the first installations in 1950, a scant 12.6 percent of orders were for automatics. Today the figure is over 90 percent.

New installations range from 32 cars in the Socony-Mobil Building in New York, to three in the Statler-Hilton Hotel, Dallas, to one in the Citizen's Bank Building in Paducah, Ky.

Not long ago a study was conducted on 14 buildings: half with the automatics, half with the operators. The automatics loaded faster, emptied faster and carried 10 percent greater loads at peak periods —since an operator normally occupies the space taken by two persons. And, as one elevator-company official put it, "They don't strike, get sick, flirt or go out for a smoke." END

Homogenized Spirits

A big-hearted distiller had sent a barrel of his best brand to an acquaintance up in the hills. Shortly afterwards, he dropped in at the mountain cabin and was surprised by a broad hint that his friend could use some more of the same.

"Look here," said the distiller, "it's only been three weeks since I gave you a whole barrel."

"Yes, I know," admitted the hillman, "but you gotta remember a barrel of whiskey don't last very long in a family that can't afford to keep a cow."—*Tracks.*

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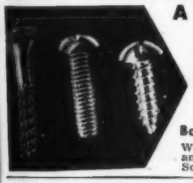

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Your 4 w. d. is a 4 w. d. work horse or 2 w. d. "pick-up" as you need it—*as you shift!* No drag, gear whine, shimmy in 2 w. d.; big savings in gas, tires, repairs. For all 4 w. ds. to 1½ tons at dealers or write:

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Size head you want snaps into ratchet drive ring from either side—can't fall out. Dies reverse easily for close-to-wall threading. Ask for **RIDGID** No. 00R for ⅛" to 1" pipe, or any combination of sizes to 2" pipe to fit your needs. Bolt die heads also, ¼" to 1", fit your 00R. Free carrier with sets. For your shop, for your home—buy this handy threader at your Hardware Store.

Famous RIDGID Pipe Wrench also gives you most service for your money!

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CAMP'S LATEX CONCRETE REPAIR

For Indoors or Outdoors

- Perfect for repairing broken step edges, cracks in walls, walks, driveways, floors, curbing, tuckpointing, smoothing rough surfaces, etc.
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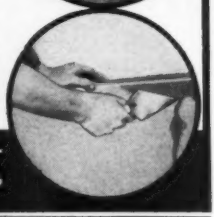
- Concrete color. Waterproof. Will not chip, crumble or powder.
- No primer required. Self-curing. Gives surfaces resiliency.
- Use from thimbleful to complete lot. No waste.
- Complete kit weighs 14 lbs. Includes special blend cementatory material, 1 qt. rubber latex and handy trowel. Send check or money order. No C.O.D.'s. Satisfaction guaranteed.



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$263.00 Complete with ½ H.P. Motor f.o.b. Pasadena, Calif.

MODERN MFG. CO.
160 N. FAIR OAKS, PASADENA, CALIF.

[*Continued from page 70*]

examination elsewhere. It fluoroscopes letters, too, a bundle at a time, and analyzes gifts of food. In each grocery store or market patronized by the White House, it designates the employees authorized to handle White House orders.

Baughman's No. 1 responsibility is presidential protection, but his most discouraging problem is check forgery. Actually, the checks are perfectly good—for Social Security payments, veterans' pensions, income-tax refunds, and other government obligations. But they have been stolen and the endorsements forged.

The summer before last a young woman skipped bail in St. Louis and continued to live by cashing government checks—in Chicago, Detroit, New York City, Miami, Jacksonville, and a handful of other cities. Checks made out to a woman, she endorsed in a normal hand; made out to a man as well as to a woman, she wrote the man's name backhand. When arrested in Houston last December, she had several checks that she had lifted from local mailboxes.

Identification? The lady forger claimed she had never been asked for any. That riles the Chief because it's an old and oft-told story.

Many people who accept government checks apparently look at nothing except the amount. Youngsters 12 years old have cashed checks marked "Old Age and Survivors Insurance." A woman cashed a $120 pension check in a furniture store although someone had drawn two lines through the endorsement and written underneath: "No good—this check was stolen." The manager of a New York City grocery store even cashed a negative photostatic copy of a check.

Every day last year the Secret Service received for investigation an average of 90 forged government checks. Losses totaled more than $2.5 million. Government checks were stolen and cashed at the rate of 101 for every million issued.

The Chief entered 1956 with a backlog of 15,000 such cases. It will grow, he's

[*Continued on page 234*]

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Enclose postage with check or money order. Dealers Invited.

FANTEX KITS SIZES	WT.	LIST	SALE PRICE
16"	7 lbs.	$15.90	$7.95
20"	8 lbs.	17.90	8.95
24"	10 lbs.	19.90	9.95
TORRINGTON KITS			
22"	17 lbs.	$25.90	$12.95
24"	20 lbs.	30.70	15.35
28"	22 lbs.	31.90	15.95
30"	25 lbs.	31.40	16.70
36"	30 lbs.	42.56	21.27

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Auxiliary Accelerator...
LEFT FOOT PEDAL

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NOW turns the ordinary shop drill into HIGH SPEED DRILL PRESS at a big saving. When DRILLMASTER is used on a 3,000 rpm drill press its top speed will be 20,000 rpm. Does the work of expensive high speed drill presses on brass, aluminum, plastics and cast iron where high speed drilling is necessary. Available for work of any size runs. Fits any ½" chuck, holding drills from 5/32 to #80. Shafts are heat treated and ground. Ball bearings and oil impregnated bearings and gear train are housed in cast aluminum. Precision made throughout. MAIL ORDER TODAY only..... **$62.50** Fob. Chgo.

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Buy these Hastings Products with confidence:
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afraid, because this year the government is expected to issue 21 million more checks than last year. He has asked Congress to authorize 25 more agents—bringing the total to 295.

Here are some things you can do to help stop the forgery racket:

If you expect a government check, have some member of the family home to receive it—or lock your mailbox.

If you cash government checks for customers, insist on proper identification—which is *not* a Social Security card or anything else that's easily stolen or duplicated.

The suppression of counterfeiting, originally the Secret Service's only job, is now the least of the Chief's worries, though still a pretty big one. Last year his agents seized more than $1,000,000 in counterfeit money. This was the most since 1951 but only $107,000 of it had been passed—the least since 1947.

The biggest operation centered in Los Angeles, where the Secret Service arrested a printer who had agreed to sell an undercover agent some bogus $20 bills. From the printer the trail led to a Los Angeles theater where the famous farce, "Charley's Aunt," was playing.

The best things to put off until tomorrow are the ones that will get you into trouble if you do them today.
—THE SIDEWALK SUPERINTENDENT

Agents slipped into the theater between the second and third acts and caught the leading man trying to hide counterfeit money totaling $9,060 under a floor board in his dressing room.

A theater handyman who had skipped with $160,000—both counterfeit and stolen—was traced to Chicago. Other passers, who had paid $25 per $100 for the money, were arrested in San Francisco and Dallas. About $500,000 was seized and 20 persons convicted. END

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1 Head can't fly off.
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$9.95 Per Pair postpaid
2000 LB. SIZE $11.95

For cars and trucks. Front and rear. Gives 2000 lbs. extra capacity for all ½, ¾, and 1 ton trucks; 500 or 1000 lbs. extra for all cars. Easily Installed. Guaranteed. State make, model. Dealers wanted.

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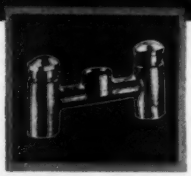

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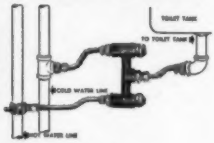

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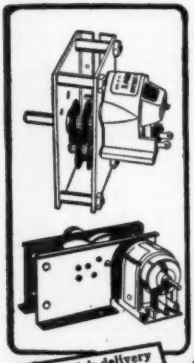

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90-Foot Eyes Will Locate Radio Stars

[*Continued from page 91*]

scientific research in Australia," Bolton explains. "I had had only a casual interest in astronomy up to that time," he adds, "but Bowen put me to work investigating radio-frequency emissions from the sun.

"You know, the sun is the only star among all the billions in our own galaxy, the Milky Way, definitely known to emit radio waves. That doesn't mean that it is the only one, of course. I suspect that we haven't yet built apparatus powerful enough to detect the others."

But "the sun got rather dull" before long. G. J. Stanley, an associate who is still with him, and Bolton then began to hunt for more interesting game. They knew that J. S. Hey, an Englishman who had been in charge of an operational research group in radar during the war, had noted that he had received radio signals from an apparently dark spot in the sky. They followed his cue.

On a clear, bright, chilly night in the Australian midwinter month of June, 1947, in an old army blockhouse on a cliff edge 250 feet above the sea near Sydney, Bolton and Stanley discovered the first "radio star."

"We were working with a very small antenna and a converted radar receiver," Bolton recalls. "It used to take us 24 hours to get the equipment in shape for one hour's observation."

The antenna was aimed northeastward, at a sector of the sky from which Hey had received vague radio emanations. The recorder of their apparatus was a stylus attached to a moving graph.

Suddenly the little room, warmed mostly by the heat from their electrically powered equipment, filled with excitement. The stylus began to draw a series of jagged peaks on the paper moving slowly beneath it.

After repeated observations, the discoverers, in at the birth of a new science, made position measurements of the invisible radio source and reported the finding of Cygnus A—so named be-

[*Continued on page 238*]

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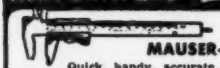

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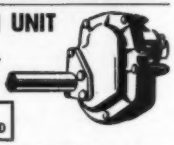

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90-Foot Eyes Will Locate Radio Stars

[Continued from page 236]

cause it was a new-found inhabitant of the constellation of Cygnus—to the scientific world.

"It was four years before we learned what we had found," Bolton says.

Not until the 200-inch telescope on Mt. Palomar went into service was there an instrument in the world powerful enough to photograph the extremely faint, incredibly distant source of the radio signals that Bolton and Stanley had received.

Cygnus A was not a star, it then turned out, but two entire galaxies in collision. The galaxies are about 30,000 light years across, and *60,000,000 light years* distant from the earth!

"It is the gaseous portions of the galaxies that are actually colliding," Bolton says. "There isn't a chance in a trillion of the stars within the galaxies crashing into one another—too much room.

"And, as a matter of fact, though we don't yet know the major source of radio emissions from outer space, the generally accepted premise is that they come from very rarefied gaseous regions in which the gas is in violent agitation."

Bolton and Stanley found five more radio stars themselves before other radio astronomers around the world joined in the hunt. In the six years since then, a couple of thousand additional ones have been located.

Bolton was invited to join the staff of Caltech in January, 1955. Stanley, at Bolton's request, joined him in Pasadena shortly afterward. They are now eagerly looking forward to tracking down fresh quarries in the heavens when the big new radio telescope in Owens Valley is ready to be put to work. END

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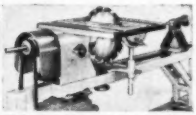

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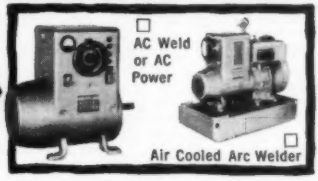

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Missiles Replace the Navy's Big Guns

[Continued from page 124]

for any contingency that might arise.

The surface-to-surface Regulus missile arms the heavy cruisers *Los Angeles* and *Helena* and will soon be in use by the *Macon*—all sister ships of the Terrier-armed *Boston* and *Canberra*. Submarines and carriers, too, have been equipped to fire the Regulus. This seven-ton, 32-foot jet missile has wings of 21-foot span and reputed transonic speed.

A jet-propelled Regulus obviously can strike at a target hundreds of miles away; an unofficial estimate of 500 miles looks reasonable. This compares with an extreme range of about 23 miles for the biggest naval guns.

That a Regulus fired at an enemy warship would carry a nuclear warhead can be taken for granted. In this day it would be nonsense to fit it with an armor-piercing nose, load it with conventional explosive and try for a direct hit. With an atomic Regulus, a near-miss is good enough to dispose of the target. The classical contest between projectiles and armor ended, with both the losers, when Bikini's atomic test shot reduced a war fleet to junk. For bombarding shore fortifications and inland targets, presumably the Regulus would likewise unleash a nuclear blast.

Since the Regulus strikes far beyond range of effective control from the launching vessel, its guidance system must differ from that of shorter-range missiles. While the Navy reveals no details, the principles of long-range missile guidance have been clearly made public:

Preset before launching, a Regulus-type missile could guide itself to a target of known direction and distance, much as German "buzz bombs" of World War II did. A magnetic compass or gyro would keep it on course. An air-driven indicator, roughly registering distance covered, would tell when it was over the target—and send it plunging to earth. Thus a lone submarine, surfacing offshore, could rain havoc upon an inland enemy base. For more precise guidance,

[Continued on page 242]

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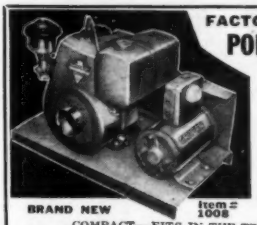

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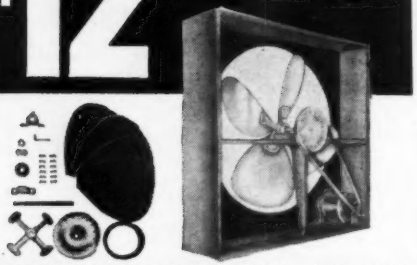

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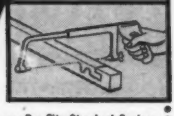

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Missiles Replace the Navy's Big Guns

[*Continued from page 240*]

attacking ships could project a radio grid such as Loran or Shoran over the target area, enabling the missile to navigate itself to the target's exact latitude and longitude.

A moving target, such as an enemy fleet at sea, presumably would require a homing device built into the missile. This device would take over the missile's guidance when it approached the target. The missile could "home" on the heat radiation from the vessels—or could pinpoint them with a radar beam of its own.

To defend themselves against such an attack, warships could be expected to use missile-intercepting countermissiles. Presumably the Navy's Terrier would chase and destroy jet missiles as effectively as it would jet planes—and so would two surface-to-air weapons developed even more recently.

A new antiaircraft missile, the Talos, reportedly is a super-Terrier with more than twice the range of its predecessor. The cruiser *Galveston* will be the first to employ it.

Coming destroyers will be armed with the Navy's "baby" Tartar missile, likewise an antiaircraft weapon. Smaller than the Terrier, it dispenses with a booster rocket, but reaches all altitudes at which present-day jet bombers fly. It will replace the five-inch guns of a conventional destroyer, and of the secondary battery of bigger warcraft.

Launched from naval aircraft at enemy ships, the air-to-surface Petrel rounds out the family of missiles revealed by the Navy to date. END

Caught in His Own Beam

Sir Robert Watson-Watt is the inventor—as much as it can be credited to any one man—of radar. And we all know that radar saved Britain from extinction by Hitler's bombers, and plays a vital role today in defense and civil life. Perhaps that is too much introduction to the rather minor fact that Sir Robert was recently arrested in Canada and fined for speeding. We wouldn't think of mentioning it if it were not for the fact that he was caught by a radar speed detector.—*Bell Telephone Magazine.*

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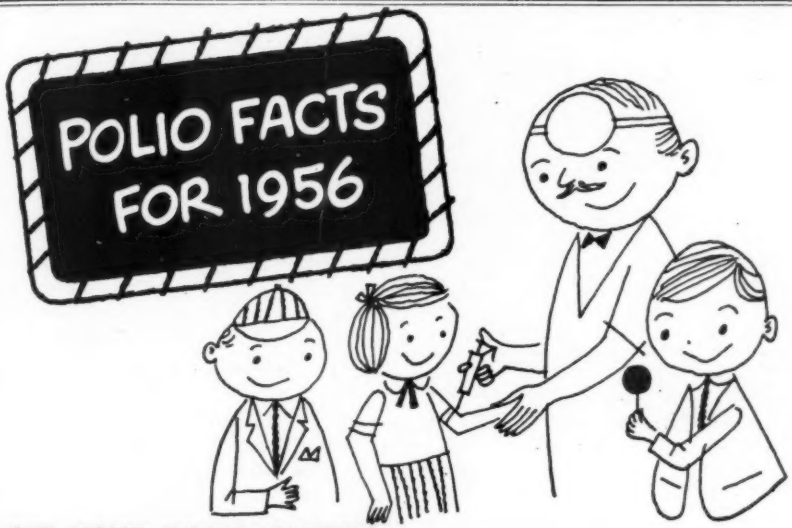

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Hot-Air Engine May Cool Your House

(Continued from page 111)

the piston down. This compresses the air in the cylinder. Some of the compressed air leaves the cylinder through a port. The rest of the air flows up and around the piston, picking up heat from the cylinder wall, which serves as a "regenerator."

As the piston starts to rise in the cylinder, hot air from the top of the cylinder flows around the piston to the bottom, losing heat to the cylinder walls. When the air reaches the bottom, it is further cooled by the water jacket. So now the air inside the cylinder contracts, and low-pressure air can enter through an intake.

The net result is to convert heat energy from the gas flame into a variation in air pressure in the cylinder. The port in the cylinder is connected by a check valve to either of two tanks. On the pressure stroke of the piston, air goes into the high-pressure tank. On the return stroke of the piston, air flows from the low-pressure tank into the cylinder. Another pipe connects the high-pressure tank to a conventional air-operated motor, which does the work that is required to operate the mechanical hookup.

As an air conditioner, the hot-air engine's air motor drives standard refrigeration machinery, just as electric motors do in electric air conditioners.

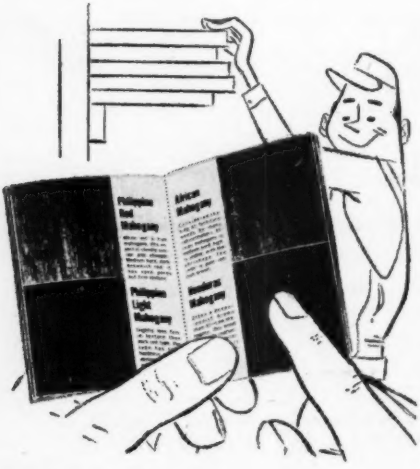
The Carnahan engine has yet to operate this way. The prototype is to be disassembled and shipped to the Coleman headquarters in Wichita, Kan. There, new versions, each of which may contain several cylinders, will be built this summer. These will operate experimental air conditioners.

How good will they be? Professor Carnahan's enthusiasm is supported by the Coleman Co.'s engineering vice-president, Alwin B. Newton, who says:

"Encouraging results have come much earlier than we anticipated. It already looks as though 22 to 24 cubic feet per hour of 1,000-BTU gas will produce one ton of cooling." (An average house requires two "tons" of cooling capacity.)

One important point is the amount of gas that the engine will burn. In many parts of the country, gas is a very cheap fuel, so cheap that gas air conditioning would be more economical in the long run than an electric system, even if the gas machinery required a greater original investment.

The new models that are now to be built should settle this important question once and for all. END



NEXT MONTH:

The Right Wood to Use

MAHOGANY? Birch? Pine? Plywood or solid? The wood makes a big difference, whether you're planning shelves or a dining-room table. Next month PSM will show you how to make the right choice.

A special section of full-color photographs made from actual wood samples will help you identify the popular varieties. It tells you which ones are strong, easy to work, resistant to decay. And it explains how to save on cost by picking woods that grow nearby. It's a workshop essential that you will want to save.